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INSTITUTE OF GAS TECHNOLOGY

THE GAS INDUSTRY'S OWN EDUCATIONAL AND RESEARCH FACILITY

CHICAGO 16, ILLINOIS

GAS ABSTRACTS

APRIL, 1958

VOLUME 14 NUMBER 4

AFFILIATED WITH

ILLINOIS INSTITUTE OF TECHNOLOGY

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O. P. BRYSCH, Editor

GAS ABSTRACTS is published and distributed monthly by the Institute of Gas Technology, Chicago 16, Illinois. The contents of selected papers and patents are reviewed impartially by the editorial staff and material of potential interest to the Gas Industry is presented. Subscription rates to non-members of the Institute: $18.00 per year to U.S. addresses; $22.00 foreign—Printed in the U.S.A.

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A microfilm edition of Gas Abstracts can be supplied by University Microfilms, 313 N. First St., Ann Arbor, Michigan.

1. MANAGEMENT

Industry Expansion

Gas Budgets Top $2 Billion Gain. (Construction Budget Survey) *Gas 34,* 57 (1958) Apr. (16 pp.)

Earmarked for expenditures are the following figures: $2,045,449,000 for total budget, down almost 6% from last year only because of the Beatrice project delay; $561,868,000 for distribution, including at least 8101 miles of new mains; $1,171,617,000 for transmission, including construction of 10,378 miles of gas pipelines; $176,722,000 for production, excluding production programs of major and independent oil companies or independent gas producers; $75,484,000 for storage, including terminal underground fields and development of the Leidy and Tamarack storage fields in Pennsylvania; $59,758,000 for general purposes, including moves designed to increase efficiency of non-operating departments and for expansion.

Stop! Look! Think! Then Re-evaluate. J. H. Brinker. *A.G.A. Monthly 40,* 31 (1958) Mar. (5 pp.)

Industry progress must be evaluated in terms of competitive fuels and dynamic economy. Statistics show that while industry has grown in terms of new customers, consumer purchase of goods and general expansion, its rate of growth when compared to gross national product and the electric industry is not favorable.

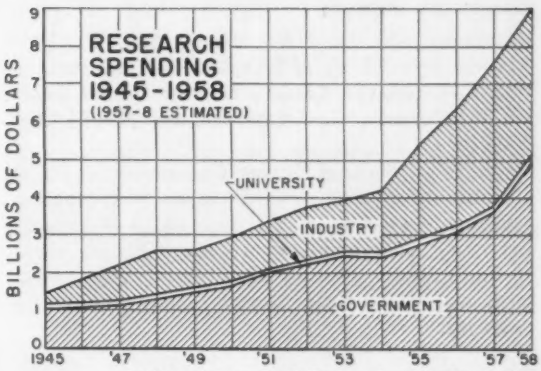
Consequences. D. D. Melvin. *Gas J. 294,* 35 (1958) Apr. 2 (7 pp.)

Position of the British gas industry is reviewed in light of a) fuel and energy shortage, b) fuel consumption and c) operating and capital costs. Effect of these factors on the future course appears to be 1) that the fuel shortage provides opportunities for all fuels, especially as to price obtainable and increased efficiency in production and use, 2) that correct pricing insures fair benefits for gas industry under careful capitalization of load development and selection of raw materials and 3) that convenience of gas will govern in expansion of demand and supply.

Natural Gas Supplements

Manufactured Gas . . . Which Processes Will Be Used to Supplement Natural Gas? F. Arne. *Chem. Eng. 65,* 121 (1958) Mar. 24 (12 pp.)

Basic considerations: winter bulge; light peak loads—supplement may be made from light liquid fuels, materials are expensive but capital investment is low; heavy peak loads—would use heavy liquid fuels, less expensive but require higher investment; eventual base loads—inexpensive coal fuel, will need heavy investment. Some processes in the latter category would qualify for baseload status. Long-range industry planning must consider alternate basic sources of high-Btu gas, even though large reserves of natural gas are assured. Realistic criterion is not reserves, but rather availability and cost of natural gas at point of use.



(*Adapted from* Basic Research Calls For Help)

Basic Research Support

Basic Research Calls for Help. *Business Week 1490,* 134 (1958) Mar. 22 (2 pp.)

While research in general has expanded, basic research has limped along on only a fraction of the money earmarked for this purpose. Projections for 1975 indicate total research and development spending could climb to $20 billion annually while basic research funds will be lucky to reach $300 million. Specific proposals for increased funds were proposed at recent AAAS Parliament.

Rate Increases

How Blue Are Those Memphis Blues? *Petrol. Eng. 30,* D-20 (1958) Mar. (4 pp.)

Interview with public utility financial analyst W. F. Stanley in which he discloses how companies may effectively use Section 5 of the Natural Gas Act to increase rates now that the Memphis decision has concluded that Section 4 is not applicable unless all customers affected had agreed to the increase.

The Memphis Case and Its Effects on the Natural Gas Industry. L. F. Cadenhead. *Pipe Line News 30,* (1958) Mar. (3 pp.)

Explanation of the meaning of the Memphis decision, which is based upon an interpretation of the Natural Gas Act and extends the application of the Mobile Decision to certain sections of the Act, is offered in this reprint of a talk by the author.

Canadian Imports

Canadian Gas for U.S.? *Petrol. Eng. 30,* D-50 (1958) Apr. (3 pp.); **Prospects for International Pipelines between Canada and the United States.** W. R. Connole. *Gas Age 121,* 46 (1958) Apr. 3 (3 pp.)

Remarks of Federal Power Commissioner W. R. Connole are directed toward long-range prospect of satisfactory solution of the problem of distributing the energy sources found in the far Pacific Northwest. Problems exist in three fields: government, legal and engineering. Prospects for solution are excellent.

Education

Education for the Gas Industry at IGT. R. T. Ellington. *Gas 34,* 134 (1958) Apr. (4 pp.)

Review of the gas industry-supported engineering education program, at both the undergraduate and graduate levels, conducted by the Institute of Gas Technology. Some of the course material, i.e., transmission, distribution and utilization, is described as are the scholarship, fellowship and work-study programs. Attention also is directed to the summer school sessions which are designed to facilitate the training of technical men in the industry who have had from one-10 years of practical experience.

Cooking Range Sales

How to Sell Gas Ranges. C. Abell. Part 1. *Butane-Propane News 20,* 52 (1958) Mar. (6 pp.); Part 2. *Ibid.,* 40 (1958) Mar. (4 pp.)

Interpretation of sales literature in terms of prospect's needs and desires is keynote to successful salesmanship. This coupled with fundamental principles of cooking and the way gas and electric ranges function to provide heat neceessary to do important types of cooking will aid in selling a range. Since most prospective customers are women, engineering features should only be mentioned in terms of how they will benefit the family.

Promotion

Pipeline, Utilities Team Up to Promote Use of Gas. *Gas 34,* 131 (1958) Apr. (3 pp.)

Seventeen different New England gas companies comprise one element of an advertising program—regional in scope—which is sponsored by Algonquin Transmission Co. with the cooperation of its New England customer companies. The program is in its third year.

Petroleum Production

Oil's Economic Outlook Becomes Critical. W. L. Baker, *World Oil 146,* 76 (1958) Mar. (2 pp.); **Oil Men Cut Back Drilling.** *Business Week 1494,* 40 (1958) Apr. 19.

Unhealthy economic conditions are fostering further sharp cuts in both U.S. crude production and refinery output. Crude production will be at the lowest level in nearly four years, and almost 1½ million bbl below March, 1957. Government curbs on crude imports have had little effect, as combined imports of products and crude continue at near record levels.

Contract Drilling Directory

Drilling Rig Locator. *Petrol. Eng. 30,* R-3 (1958) Mar. (33 pp.)

Listing of over 2800 rigs owned and operated by nearly 800 drilling contractors in the U.S. and Canada. Special section on U.S. offshore operations along with a list of some foreign contract rigs is included. Listing contains contractors' names and addresses, rig number or name, type power and fuel, total hp to maintain mud pumps, drawworks make and model, hp available to drawworks, rated drilling depth and current location.

Research

How Cal Research Keeps Scientists Happy. *Business Week 1492,* 66 (1958) Apr. 5 (6 pp.)

Cal Research, member of the Standard Oil of California family, was established as a separate subsidiary because it was designed to serve the research needs of Standard's whole complex of exploration, producing and refining companies, as well as its newborn petrochemical subsidiary. History and operation of this research organization.

Solihull-Investigation of the Complete Gasification of Small Coals. *Gas J. 294,* (1958) Apr. 2 (5 pp.)

Midlands Research Station of the Gas Council is described. Research and pilot installations on Lurgi gasification, slagging gasification and fluidized gasifier for coals, and pressure gasifiers for heavy and light oils are discussed.

Lurgi Gas Plant

Britain's First Lurgi Plant to Be Built in Fife. *Gas World 147,* 473 (1958) Mar. 8 (2 pp.); **Lurgi Plant Will Open New Era in Scotland.** *Gas J. 293,* 485 (1958) Mar. 5 (3 pp.); **Britain's First Lurgi Plant to Be Built in Scotland.** *Gas T. 92,* 45 (1958) Mar. (2 pp.); **First Lurgi Gas Plant for Britain.** *Chem. Ind. 11,* 325 (1958) Mar. 15 (2 pp.)

First Lurgi-type high pressure complete gasification plant to be built in Britain, at a cost of about £6.5, is expected to contribute to national economy by cutting fuel imports. Associated high and medium pressure mains probably will boost total cost to about £8,454,000.

Kent Refinery

The £30m. Expansion of the BP Kent Refinery. *Petrol. 21,* 113 (1958) Apr. (4 pp.)

Expansion of the refinery at the Isle of Grain will have brought the British Petroleum Co. Ltd. into line with latest and imminent future demands of the petroleum markets. Article includes a list and brief explanation of 18 new process units.

Labor Relations

Compulsory Arbitration for Utilities—A Reappraisal. E. Sussna. *Public Util. Fortnightly 61,* 433 (1958) Mar. 27 (14 pp.)

Actual results of any forced arbitration involve problems. Labor unions are exempted from rules against conspiracy which are used to prevent price fixing by businessmen. Some people assert that forced labor results from governmental interference. Practical problem is that mass discomfort caused by utility strikes may be such that people may eventually insist on compulsory arbitration.

Personnel

Effective Personnel Development. J. A. Olmstead. *A.G.A. Monthly 40,* 24 (1958) Mar. (3 pp.)

Persons delegated the responsibility for administering appraisal and planning of training phases should be those in the best position to know the capabilities of the personnel under consideration. Training staff should serve in a planning, advisory and coordinating capacity.

LP-Gas Employee Education. C. C. Turner. *LP-Gas 18,* 33 (1958) Apr. (8 pp.)

Need, method and tools of an employee education program are outlined. Article is designed to make employees more productive.

Public Relations

PR Keeping Pace in Gas Industry. S. F. Silloway. *A.G.A. Monthly 40,* 15 (1958) Mar. (5 pp.)

Steady growth has characterized gas industry public relations programs in recent years; however, even more extensive broadening of their scope is expected in the future. Most important services: application of public relation techniques to dissemination of basic facts regarding regulatory problems in readily understandable form and fostering increased unity and coordination among producer, pipeliner and distributor.

Is Taxed Speech Free Speech? R. D. Furber. *Public Util. Fortnightly 61,* 447 (1958) Mar. 27 (5 pp.)

Utilities should be free to defend themselves on an equal basis against those who would tear them down, tax them unfairly or put them out of business. Action contrary to this principle is contrary to the basic principles of American free enterprise.

Information Research

The Translating Machine: An ABC for You. D. C. Greenwood. *Prod. Eng. 29,* 30 (1958) Mar. 24 (4 pp.)

Mechanical translation may never attain the intended ideal, but it can serve adequately. Three main platforms to success in mechanical translation are lexical, syntactic and semantic.

Safety

Enthusiasm Reigns at A.G.A. Safety Workshops. *A.G.A. Monthly 40,* 20 (1958) Mar. (2 pp.)

Company safety representative lauds A.G.A. Executive Safety Committee's course, "Accident Prevention Through Informed Supervision."

Royalty Costs

Royalties—or Research? W. L. Nelson. *Oil Gas J. 56,* 170 (1958) Apr. 7.

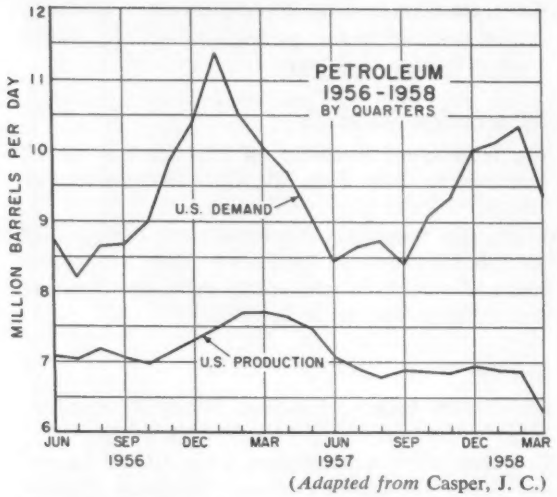
Tabulations of commonly accepted royalty rates and of approximate average cost of refinery royalties (or for research and patents) in cents/bbl.

2. ENERGY SUPPLY AND ECONOMICS

Oil Imports

How President's Order Cuts Imports. *Oil Gas J. 56,* 50 (1958) Mar. 31 (2 pp.); **New Imports Plan Prompts Control Bill.** *Petrol. Week 6,* 9 (1958) Apr. 4 (2 pp.); **Oilmen Jeer at Import Quotas.** *Business Week 1492,* 29 (1958) Apr. 5; **Ikard Bill to Touch Off Import Battle.** *Oil Gas J. 56,* 101 (1958) Apr. 7 (2 pp.)

President Eisenhower has approved a cabinet committee recommendation that crude oil imports into the area east of the Rockies be limited to 12% of domestic production in this area. This amounts to a cutback of 713,000 bbl/day. Program is voluntary, but those who do not comply face loss of government business. Oilmen, anticipating loopholes, continue to drive for legislative protection, however; 22 oil companies expect the coal and fluorspar industries to join them in backing the Ikard bill which would direct the President to limit imports of products and crude by means of quotas, adjustable quarterly. Measure sidesteps idea of curbing imports by high tariffs; instead calls for sale of import licenses to highest bidders.



(*Adapted from* Casper, J. C.)

Energy Resources

Shale, Coal Gas to Supplement Natural. *Oil Gas J. 56,* 110 (1958) Apr. 7 (2 pp.); **Nuclear, Solar Energy to Aid Gas.** M. A. Elliott and M. Chandler. *A.G.A. Monthly 40,* 29 (1958) Apr. (3 pp.)

M. A. Elliott, director of the Institute of Gas Technology, projects today's science and technology frontiers into future gas operations. Predictions are made for liquefied natural gas, oil-shale gasification, coal methanation, nuclear energy, solar energy and fuel cells.

Fuel Cells

Fuel Cells—Potential Source of Electrical Energy. G. J. Young and R. B. Rozelle. *Mineral Industries 20,* 1 (1958) Jan. (4 pp.; pub. by Penn. State U.)

Fuel cells, with their high conversion efficiencies and long operating life, may provide an important source of electric power in the future. Suggested applications range from small-scale power sources for military electronic devices to large-scale power plants to supply electrometallurgical industries.

Electricity Directly from Gas? *Petrol. Eng. 30,* D-42 (1958) Apr. (2 pp.)

Designed to work at ambient temperatures (120°-140°F) and at approximately atmospheric pressures, new fuel cell eliminates need for costly and bulky auxiliary equipment and heavy pressure vessels. It has efficiency of 65-80% using hydrogen and oxygen. Research laboratories are excited over possibilities.

Petroleum Products

Latest Figures . . . Industry Trends. J. C. Casper. *Oil Gas J. 56,* 191 (1958) Apr. 14 (6 pp.)

With the distillate season almost finished, the industry has allowed yields to increase on gasoline stock since March. However, with no reduction in March gasoline stock since 1946, the refiners cut the crude oil runs to the refineries to 642,000 bbl less than March 1957, to hold already shaky prices. Crude daily production for March was cut to 1,355,548 bbl less than a year ago.

Drilling

Deeper Drilling Trend Seen in AAODC '57 Statistics. *Petrol. Eng. 30,* B-125 (1958) Mar. (2 pp.)

Average well depth in U.S. in 1957 was 4120; in 1956, it was 4022 ft and 4044 ft in 1955. Average contract cost per ft in 1957 fell to $4.60, a 10-year low, while total drilling cost per ft rose to an all-time high of $14.

Wildcat Scoreboard for '57. B. W. Blanpied. *Oil Gas J. 56,* 132 (1958) Mar. 17 (5 pp.)

For 14 years, "rank" wildcats have comprised approximately 55% of total number of exploratory holes. Last year, this group had an average depth of 4,873 ft—59 ft deeper than in 1956. Total of all exploratory tests was 14,707, down 1466. Average depth of 4701 ft was 127 ft deeper than in '56.

Deep Wells Increase 28%. E. Adams. *Petrol. Eng. 30,* B-21 (1958) Mar. (10 pp.)

Operators drilled 199 holes 15,000 ft or below in 1957 at a cost of $148 million. Results: discovery of 15 new fields, 45 new sands and extensions and the addition of 33 producing field wells. Over-all drilling activities, including deep wells, dropped 8%.

How to Get the Most Hole for Your Money. J. W. Speer. Part 1. *Oil Gas J. 56,* 90 (1958) Mar. 31 (7 pp.); Part 2. *Ibid.,* 148 (1958) Apr. 7 (7 pp.); **Determining Optimum Drilling Techniques.** J. W. Speer. *World Oil 146,* 93 (1958) Mar. (5 pp.)

Simple method enables determination of that combination of weight on bit, rotary speed and hydraulic horsepower which produces minimum drilling costs. Empirical relationships show influence on penetration rate of weight on bit, rotary speed and hydraulic horsepower. Optimum weight on bit is shown in relation to formation drillability and optimum rotary speed is related to weight on bit. These five relationships are then combined into a chart for determining optimum drilling techniques from a minimum of field test data.

Exploration

New Journal Oil and Gas Maps. *Oil Gas J. 56,* 103 (1958) Mar. 17 (18 pp.)

Special exploration section contains comprehensive collection of 16 pool maps of principal oil and gas

areas in U.S. Included are California, Intermontane Basins, No. Wyoming, Williston Basin, Kansas, Julesburg Basin and the Four Corners Area, Hugoton Area, Oklahoma, No. and East Texas, Permian Basin, West Gulf Coast, So. Texas, East Gulf Coast, Miss.-La.-Ark., Tristate Area and Michigan.

Production

Stimulation Techniques that Enable Gas Production to Keep Up with Growing Demand. A. B. Water, F. N. Liscum and H. J. Ayres. *Oil Gas J. 56,* 77 (1958) Mar. 31. (5 pp.)

Special stimulation techniques are responsible for much of the increase in gas production over the last few years. These procedures fit into four general categories: 1) explosives; 2) acidizing; 3) hydraulic fracturing and 4) special chemical treatments.

What 8 Days Will Mean to Texas. R. J. Enright. *Oil Gas J. 56,* 47 (1958) Mar. 31, (3 pp.); **Texas Bears Brunt of U.S. Cutback.** *Oil Gas J. 56,* 103 (1958) Apr. 7.

In April, state revenue may run $4 million under estimates, posing a deficit of perhaps $30 million by June 30. Oil unemployment, up 17% in February over last year, will rise even higher in March and April. Bank loans are being sought by more producers; some cannot qualify. Contractors, truckers and suppliers are also hit. Output is down and gas lines are being squeezed. Producer income, off more than 1.5 million, will slip further in April.

Peak Shaving

Trends in Peak Shaving Methods and Planning in New England. W. P. Earley. *Gas Age 121,* 15 (1958) Mar. 20 (2 pp.)

New England believes that operation of peak shaving facilities at the point of usage will increase within the next decade. Peak shaving facilities of a decentralized nature appear to be the only solution. Since most companies are reluctant to decrease heating value, New England is further committed to high Btu facilities.

Reserves

Sahara Seismic Operations. A. D. Waldie. *World Petrol. 29,* 42 (1958) Mar. (4 pp.); **Algeria's Sahara: Booming Seismic Frontier.** A. D. Waldie. *World Oil 146,* 126 (1958) Apr. (5 pp.)

Some 20 seismic reflection and refraction crews (including two weight-dropping crews) and three gravity crews were in operation on permits covering about 280,000 sq miles in the Sahara. Main impetus for increased activity in Algeria: recent estimates indicate a potential of 1.4 billion bbl of crude oil beneath variable surface formations of hard and abrasive limestone.

Radiation Applications

Promise in Buried Atom Blasts. *Business Week 1490,* 27 (1958) Mar. 22 (2 pp.)

AEC staff members are enthusiastic, oil people cautious about application of nuclear explosions to oil operations. For long range possibilities: one oil company thinks that underground heat might retort the oil in shale, thus liquefying it. Wider scope includes production of radioisotopes, induction of chemical reactions (gasification coals) and study of internal earth structure.

Nuclear Energy

Euratom Craves Help from U.S. to Build Up to Six Power Plants. *Business Week 1494,* 111 (1958) Apr. 19.

Euratom's plans to build four to six nuclear power plants (total capacity 1-million kw) by 1961 hinges on 1) U.S. financial and technical assistance and 2) an agreement on U.S. inspection rights.

Expansion in Nuclear Fuels. *Business Week 1494,* 76 (1958) Apr. 19 (2 pp.)

New plant at Erwin, Tenn., affords private industry volume production of a variety of fuels for use in different types of atomic reactors.

Solar Energy

Building a Storage Bin for the Sun's Rays. *Business Week 1494,* 70 (1958) Apr. 19 (3 pp.)

Popular version of heat absorbing and storage systems for solar energy house heating; article discusses the new Phoenix house of the Association for Applied Solar Energy and the Lexington, Mass., house of MIT.

Indonesian Troubles

Oil Has Big Stake in Indonesian War. *Oil Gas J. 56,* 98 (1958) Mar. 17 (2 pp.)

Three oil companies may be affected by the rebellion against Indonesia's central government. Caltex Pacific Co. is right in the middle of the friction area. Some personnel is remaining at Rumbai, but Caltex families have been sent to Singapore as have 13 company tankers. Stanvac and Shell holdings are outside the firing area—so far.

Italian Gas Industry

Problems and Prospective Advance of Domestic Use of Natural Gas. D. Ciuffolotti. *Rivista dei Combustibili 12,* 5 (1958) Jan. (15 pp.)

General picture of the current usage of methane as a household appliance fuel. Consideration of the economical and technical viewpoints suggests integration of methane with propane as a means of

overcoming the difficulties ensuing from further development of methane for household use.

The Actual Situation in Domestic Use of Natural Gas. I. Giordano. *Revista dei Combustibili 12,* 20 (1958) Jan. (25 pp.)

Review of the status of town gas industry in Italy following the introduction of natural gas. Article points to difficulties arising from growing winter peak consumption caused by indiscriminate utility demand, and stresses the principle that solution lies in making available to users all the gas fuel required for this purpose. Solution suggested should prove technically and economically feasible for utility companies in question.

3. NATURAL GAS AND PETROLEUM PRODUCTION

Core Analysis

Evidence of Chromatographic Effect during Flow of Gases through Oilfield Cores. W. A. Roper, T. Doscher and R. Kobayashi. *J. Petrol. Tech. 10,* 61 (1958) Mar. (3 pp.)

Surface areas of many oilfield cores, when partially saturated with oil, are sufficiently large to produce gas-liquid chromatographic effects when longitudinal diffusion is substantially absent. This effect results in a different rate of flow for each component when a mixture of components is eluted with a substantially pure substance. These effects may be significant in certain production operations and in the characterization of oilfield cores.

Predicting Reservoir Performance from Core Analysis. B. A. Elmdahl. *Petrol. Eng. 30,* B-95 (1958) Mar. (7 pp.)

Graphical method can be applied to any virgin reservoir—sand or limestone. These curves can be used in deciding whether to set pipe, drill additional exploratory wells or to abandon hole.

Pore Volume Compressibilities of Sandstone Reservoir Rocks. I. Fatt. *J. Petrol. Tech. 10,* 64 (1958) Mar. (3 pp.)

Laboratory measurements of pore volume compressibilities on core samples were conducted for typical reservoir sandstones at reservoir pressures. These compressibilities vary for each reservoir sample and cannot be correlated to porosity. They are also found to be functions of pressure.

Drilling

A High-Speed Low-Torque Drilling Device. G. E. Cannon. *Petrol. Eng. 30,* B-82 (1958) Mar. (4 pp.)

Problem of drilling hard formations at reduced bit weight in crooked-hole country is solved by turbine-driven tool.

Air Drilling Experiment Cuts Time, Cost in South Oklahoma. D. Gatlin. *Drilling 19,* 82 (1958) Apr. (3 pp.)

Sufficient air volume is the secret of successful air drilling in southern Oklahoma. Atoka County (Okla.) venture supports this theory.

Could We Drill a 50,000-ft Hole? *Petrol. Eng. 30,* B-44 (1958) Mar. (5 pp.)

Panel of drilling experts agreed that, if economics were not a factor and in spite of high anticipated temperatures, U.S. oil industry has the equipment and know-how to penetrate the earth nearly 10 miles. ASME members met in Houston, Texas, to hear the following topics discussed by eight experts: earth conditions, P. Weaver; casing and drill pipe, S. Reynolds rig equipment, J. Abernathy; drilling fluid, O. W. Van Dyke; electrical logging, W. B. Steward; drilling bits, L. Payne; cementing, W. D. Owsley, and operations, T. Pennington, Jr.

Drilling in Maranon Basin of Peru. A. H. Allbee and S. T. Pees. *Petrol. Eng. 30,* B-62 (1958) Apr. (5 pp.)

Flooding river, dense jungle, long supply lines and hard formations made exploratory drilling a challenge. Light, highly mobile drilling rig, especially designed for operation in this area, was used in three deep wildcat sites.

Drill Pipe Rotation Reduces Pressure Drop. H. Ferrell, E. C. Fitch and J. H. Boggs. *World Oil 146,* 159 (1958) Apr. (5 pp.)

Greater penetration depths have increased circulation problems; e.g., power requirements. Effect of various types of drill stems, tool joints and bit nozzles have been extensively analyzed but outside of work by F. Levy, little has been done to explain the effect of rotation on flow characteristics. Article describes work accomplished on this problem.

Well Bore Stabilization. W. J. Weiss, R. H. Graves and W. L. Hall. *Petrol. Eng. 30,* B-43 (1958) Apr. (9 pp.)

Stabilization of well bore as the result of its contact with a shale controlling mud composition. Shale control mud system is shown not only to preserve, but progressively to solidify such sensitive shales in a manner previously only possible by use of the silicate mud system and to differ radically from presently used drilling fluids such as the high pH limed muds, salty muds, gypsum base muds and other surfactant muds. Use of this system has permitted penetration of shale sections previously considered impossible while using older techniques.

What It Takes to Plan a Super-Deep Well. R. W. Holman. *Petrol. Eng. 30,* B-31 (1958) Mar. (9 pp.)

Caddo County, Okla., is the site of one of the largest and most elaborate land rigs in the country. Projected to 24,000 ft and engineered for 25,000 ft, three records have already been broken: 1) biggest single cement job on, 2) longest string of 13⅜-in. casing in and 3) deepest 17½-in. hole.

Drilling Mud

Drilling Mud Program for the Lake Maracaibo Area. *Drilling 19,* 100 (1958) Apr. (2 pp.)

Low *pH* emulsion muds are in common use in Lake Maracaibo and are used for drilling to 10,000 ft. Sometimes these muds are weighted to 14 lb/gal. Several of the new companies drilling in this area are using low-lime-oil emulsions; however, one major complaint about low-lime mud is the low resistivity that results in poor electric logs.

Lubricating Mud Additive Extends Bit Life. *World Oil 146,* 186 (1958) Apr. (2 pp.)

One corporation has developed a mud additive which reduces time for drilling deep wells as much as 12½-25% while extending the life of drilling equipment. Drilling fluid has extreme pressure lubricating qualities, which lubricate drill bit bearing and entire hole. Laboratory tests have been successful; company plans to share additive with industry through licensing with mud service organizations.

Exploration

Cretaceous Possibilities Good for Northwest Kansas. D. F. Merriam. *Oil Gas J. 56,* 138 (1958) Mar. 31 (3 pp.)

Cretaceous rocks, up to 3000 ft thick, in northwestern Kansas are predominantly marine; they contain good reservoir beds (Dakota and Cheyenne sandstones) with adequate cover. Structure and stratigraphic variations for traps are favorable and they are reported to have had numerous shows in northwestern Kansas.

Exploration Problems in Peru. C. Solar B. *Petrol. Eng. 30,* B-21 (1958) Apr. (5 pp.)

Terrain, climate and wildlife pose real challenge for exploration projects in Peru. But oil is there, concessions are readily available and terms are favorable.

Geological Features of Peru. J. E. Rassmuss. *Petrol. Eng. 30,* B-26 (1958) Apr. (6 pp.)

Of Peru's three oil provinces, the coastal area still is the principal commercial producer, but the vast Amazon Basin encloses one of the biggest prospective areas in South America.

Here's a New Oil-Finding Tool—It's Aerial Color Photography. *Oil Gas J. 56,* 122 (1958) Mar. 17 (3 pp.); **Color Aids Photogeological Interpretation.** J. I. Gimlett and K. E. Hunter. *World Oil 146,* 123 (1958) Apr. (3 pp.)

New technique enables geologist to do field work in his office by carefully interpreting surface structures that may be completely overlooked by field work. Mosaics reveal subtle color changes in soil, vegetation and surface outcrops. For more critical inspection after selecting a specific area from the mosaic, stereo pairs in print or transparency form provide even greater clarity and color contrast.

Oil Future of the Oriente Zone: Exploration to End Use. L. J. Herrera, Jr. *Petrol. Eng. 30,* B-94 (1958) Apr. (3 pp.)

Cerro de Pasco Corporation, one of the largest industrial enterprises in Peru and also the largest single consumer of industrial fuel, poses a real task for the Cerro de Pasco Petroleum Corporation, one of the youngest members of the Peruvian Petroleum Corporation—find, produce and supply oil for the parent company.

Ordovician Pay Zones Attractive Lure in Southern Oklahoma. F. P. Schweers. *Oil Gas J. 56,* 126 (1958) Mar. 17 (6 pp.)

Review of pre-Atokan production and its possibilities. Currently, southern Oklahoma fields account for 1 out of every 27 bbl of oil produced in U.S. Author believes it will take a lot of disciplined, imaginative thinking and new interpretations to find new and deeper reservoirs.

Seisverter Updates Old Seismic Records. *World Petrol. 29,* 71 (1958) Mar. (2 pp.)

Conventional seismograms can be updated by integrating old recordings with those taken with modern magnetic systems by means of new recording device. Processeed conventional seismograms are placed in magnetic storage. Machine gives corrected new cross section display.

Subsurex—A New Approach to Geophysical Exploration Using Sonic Frequencies. L. R. Padberg, Jr. *World Petrol. 29,* 60 (1958) Mar. (4 pp.)

Experimental equipment employing electronics produces more readable subsurface records with higher resolution. Highly repetitive sound sources are used to replace explosives. Deep penetration is obtained from a survey boat which travels at 600 ft per min. Recent experimental work involves use of an underwater electric spark for offshore surveys, and a new compact sound source for use in shallow bore holes to replace conventional explosives.

The Seismic Magnetic Integrator. E. G. Schempf and K. A. Robertson. *World Petrol. 29,* 56 (1958) Mar. (4 pp.)

New method of magnetic recording eliminates extraneous energy from seismic records. Useful records are being obtained through magnetic integration in difficult areas where seismic exploration has been largely unsuccessful.

22 Lorac Stations Guide Seismic Surveys in Gulf of Mexico. J. W. Calvert. *World Petrol. 29,* 46 (1958) Mar. (4 pp.)

Electronic navigation is backbone of geological exploration in submerged oil fields of Gulf of Mexico. Developed since World War II, Lorac (LOng Range ACcuracy) measures phase difference of radio waves received from two continuous-wave transmitters located on land. Proof of positioning accuracy: claims are that Lorac-equipped boat can return to same point ± 10 ft in best areas and to a point ± 100 ft in unfavorable locations.

Two Problems in Seismology. C. D. V. Wilson, *Petrol. 21,* 128 (1958) Apr. (3 pp.)

Wedge diffraction and anisotropy problems have been neglected, possibly because of their difficult or intractable nature, if they are to be solved formally. There has not yet been a rigorous mathematical solution for either of them. Author shows that in each case further insight can be obtained by field and laboratory work.

Geology

Quantitative Photogeology—Popular Exploration Tool. L. Brundall and V. Jackson. *World Oil 146,* 85 (1958) Mar. (6 pp.)

Greatest application of photogeology in the past has been in qualitative geological work. Continuous refinement of this method was made possible through use of high-order plotting instruments. Instruments for satisfactory quantitative geologic work have recently become available. Data obtained through quantitative photogeology are used to prepare structural contour maps, profiles, isopach maps and in hydrodynamic studies.

Geophysical Exploration

Discovery of Stratigraphic Traps by the Reflection Seismograph. G. H. Westby. *Oil Gas J. 56,* 144 (1958) Mar. 17 (7 pp.); **New Way to Locate Stratigraphic Traps.** D. W. Slattery. *World Oil 146,* 140 (1958) Apr. (6 pp.)

Innumerable possibilities for oil production from stratigraphic traps at relatively low exploration costs exist. Most strat traps thus far have been accidental discoveries, but geophysical efforts have been successful in mapping certain strat traps. New seismic techniques and instruments hold promise of making routine discovery of certain types of strat traps.

Logging

Induction-Electrical Logging in Oklahoma. H. W. True. *World Oil 146,* 108 (1958) Mar. (6 pp.)

New logging device is helping operators in Oklahoma to determine true formation resistivities with greater accuracy. It has only limited service. Effects of mud column, invaded zone and adjacent bed are minimized.

Laboratory-Determined Electric Logging Parameters of the Bradford Third Sand. J. Moore. *Producers Monthly 22,* 30 (1958) Mar. (10 pp.)

More than 150 samples of the Bradford Third Sand and adjacent shales from two wells approximately 1900 ft apart were analyzed. Electric logging parameters were assigned to the formation as a whole and to each permeable zone of both wells that was analyzed. Electrical properties of the formation were shown to vary significantly in both a vertical and a lateral direction.

Offshore Operations

Manifa is Second Persian Gulf Offshore Discovery. H. T. Brundage. *World Oil 146,* 159 (1958) Mar. (2 pp.)

Aramco's new field is eight miles offshore and about 20 miles southeast of Safaniya, first offshore field. New find appears to be a major field.

New Sea-Going Pipe Layer. L. Resen. *Oil Gas J. 56,* 180 (1958) Mar. 17 (3 pp.)

Description of latest addition to a growing fleet sparked by an upswing in offshore pipelining. Vessel is equipped with traveling gantry crane capable of handling all lifting chores, facilities for setting risers and piling without assistance of a derrick barge, boasts a battery of davits for lowering and raising pipe over the side without outside aid and facilities for storing additional pipe to special holds to insure against transportation delays.

Production

A Review of the Production Performance of Three Deep Miocene Oil Pools in the Los Angeles Basin. C. L. Doyle. *J. Petrol. Tech. 10,* 23 (1958) Mar. (7 pp.)

Case history of three pools with emphasis on 1) describing the accumulation, 2) reviewing oil and gas production performance and indicated oil recovery efficiency and 3) comparing the behavior and recovery experience of the three accumulations.

Seeligson Unit Formed for Secondary Recovery. J. N. Schuelke. *World Oil 146,* 191 (1958) Apr. (10 pp.)

Consolidation of oil and gas interests of the Seeligson field into a single operating unit culminated nine years of geological and engineering work and should result in an increase of the ultimate oil recovery of 60 million barrels, or approximately 40% more income for operators and royalty owners. Computations covering 58 reservoirs to obtain gas and oil participation factors for each tract are given.

Reservoir Engineering

A Method for Predicting Pressure Maintenance Performance for Reservoirs Producing Volatile Crude Oil. R. H. Jacoby and V. J. Berry, Jr. *J. Petrol. Tech. 10,* 59 (1958) Mar. (6 pp.)

Vaporization of a volatile oil repeatedly contacted with dry gas can be adequately predicted with multicomponent flash calculations. Conventional frontal-drive methods are inadequate for predicting oil recovery performance and underestimate total oil recovered by gas injection method. Efficiency of oil recovery by gas injection into volatile oil reservoirs decreases with progressive rapidity with a decrease in operating pressure.

Analysis of Pressure Decline. H. Samara. *J. Inst. Petrol. 44,* 60 (1958) Mar. (6 pp.)

Principle of superposition of states is used implicitly and explicitly as a basis for a new approach to analysis of pressure decline curves. Analysis is valid for any laws of flow and for any geometrical boundaries of the reservoir, as long as superposition principle remains true. Analysis enables prediction of 1) bottom hole pressure differential from short flow in wells and 2) future pressure decline in reservoir, provided that it has produced long enough.

New Methods Show Promise of Increasing Oil Recovery. C. D. Russell. *World Oil 146,* 130 (1958) Mar. (5 pp.)

Solvent extraction and miscible fluid displacement show great promise for increasing recoverable oil reserves. Basic laboratory and theoretical work on solvent extraction processes have demonstrated considerable progress. This engineering field is still in an evolution phase. Considerable, and expensive, field testing will be necessary to determine field circumstances where solvent extraction processes work most advantageously.

Well Practice

Higher Strength Casing for Bottom-Hole Pressures of 15,000 psi. S. H. Reynolds. *World Oil 146,* 153 (1958) Apr. (3 pp.)

Longer protection strings can be set because of stronger casing, capable of withstanding higher pressures and increased stresses of deeper drilling. Three tables show comparison of API Grade P-110 and Tentative Grade V-150, Minimum Collapse Resistance under Axial Tension Stress, and 14,000 and 18,600-Foot Casing Combination Designs, respectively.

Workover Costs Reduced with Concentric Tubing Tool. R. J. Goeken. *World Oil 146,* 135 (1958) Mar. (7 pp.); **Concentric Tubing Method Rivals Wireline Workover.** R. J. Goeken. *Drilling 19,* 104 (1958) Apr. (3 pp.)

Use of ¾-in. tubing as a workover tool resulted in net savings of more than $500,000, based on conventional rig costs, on 71 jobs completed by one company in the Louisiana Delta. Work procedure is simple, cost is low. It is expected that outstanding success of concentric-tubing workovers will amplify and improve principles of permanent-type well completions.

Well Stimulation

Calculated Temperature Distribution for Hot Water Floods in Ideal Reservoirs. B. L. Landrum, J. Pyburn, S. W. Poston and P. B. Crawford. *Producers Monthly 22,* 40 (1958) Mar. (5 pp.)

Report of a study to determine the temperature distribution when injecting hot water into an adiabatic, homogeneous or ideal reservoir. It is believed that the injectivity may be increased by controlling the deposition of waxes which may occur when the reservoir temperature is lowered, and that ultimate recoveries may be increased as a result of the rise in mobilities associated with high temperatures.

Evaluation of Iron Sequestering Agents in Water Flooding. W. E. Bell and J. K. Shaw. *Producers Monthly 22,* 20 (1958) Mar. (4 pp.)

Sequestering agents have been used in field operations to prevent precipitation of iron salts through the strata at the bottom of water-injection wells. Laboratory procedures to evaluate these agents have shown that citric acid is the only sequesterant which effectively prevents deposition of insoluble iron compounds under conditions approximating water flooding operations. Details are presented.

Williston Basin

Williston May Rival West Texas. N. S. Morrisey. *Oil Gas J. 56,* 253 (1958) Mar. 24 (5 pp.)

Recent deep tests in Williston Basin have disclosed tremendous potential of the pre-Madison section. Williston basin produces primarily from carbonate rocks. Until recently, Madison Mississippian lime-

stone was main pay zone, but recent significant wildcat strike tested 671 ft of productive interval through perforations entirely below the Madison limestone.

Oil-Sand

Process for Separating Oil from Bituminous Sands, Shales, etc. G. R. Coulson. U.S. 2,825,677 (1958) Mar. 4.

For separation of bitumen or "crude oil" from a bituminous sand, a hydrocarbon diluent is added, then two volumes of aqueous medium, mixing to form a slurry and then centrifuging to form a free water barrier between sand and oil.

4. GAS CONDITIONING AND LPG RECOVERY

Gasoline Recovery

Curves for Rapid Estimation of Gasoline Plant Investment. B. T. Brady and R. L. Rorschach. *Petrol. Eng. 30,* C-7 (1958) Apr. (2 pp.)

Method consists of selecting cost values from individual curves for each major processing section of a gasoline plant, correlating a wide variation in feed gas conditions and processing scheme. Given the plant location, the amount, composition and pressure of the gas and the required hydrocarbon extraction, the plant investment can be estimated in a short time with about 85% accuracy.

CO_2 Removal

Removal of CO_2 from Natural Gas. K. H. Hachmuth, R. D. Kuerston, R. L. McIntire and R. O. Shelton (assigned to Phillips Petroleum Co.) U.S. 2,826,266 (1958) Mar 11.

Carbon dioxide is washed from natural gases by contacting with cooled natural gasoline at 1600 psi, stripping CO_2 from the gasoline and recirculating it in heat exchange with expanding cold gas.

Separators

Separator. W. L. Scheirman and G. C. Opel (assigned to Black, Sivalls & Bryson, Inc.) U.S. 2,825,423 (1958) Mar. 4.

Tangentially injected well stream loses liquids by centrifugal force behind an annular baffle curtain, around which the gas must change direction 180° before upward exit flow. Liquids drain to lower portion where accumulation is freed of solid hydrates by heating coils and water-hydrocarbon interface is kept low by float-valve discharge of water below while hydrocarbon rises through a central pipe, through an annular overflow return conduit to a middle-level float-valve controlled descharge line.

5. NATURAL GAS TRANSMISSION

Automation

Automatic Control in Pipeline Systems. K. Kridner. *Gas Age 121,* 36 (1958) Mar. 20 (5 pp.)

Effect of automatic and remote control and instrumentation on a hypothetical 500-mile, large-diameter pipeline. Conditions: six booster stations using reciprocating engines and centrifugal compressors; 1500 miles of microwave facilities to be installed.

Compressors

Keep Your Gas Centrifugals on the Line. F. V. Long. *Gas 34,* 125 (1958) Apr. (3 pp.)

Description of surge detection and control devices being field tested in three 15,000-hp single-unit centrifugal compressor stations by a major gas pipeline company. Devices can detect and in most instances institute corrective measures to counteract problems of surges long before a compressor station operator can become aware of trouble.

Proper Lubrication=Longer Compressor Life. H. P. Henderson. *Petrol. Eng. 30,* D-26 (1958) Apr. (3 pp.)

Analysis of lubrication problems prevalent in gas and air compressors and tips on how to control them.

Compressor Engine

Preventive Maintenance Practices for Gas Engines. D. M. Taylor. Part 3. Annual Overhaul Reports. *Petrol. Eng. 30,* D-36 (1958) Mar. (4 pp.)

Engine records should indicate past and present performance and project repairs and expenses that should be performed to insure profitable future opration. Useful records will not only indicate trends in engine failures, but will serve as a yardstick for efficiency of engine operation.

Compressor Stations

Hope Natural's Push-Button Compressor Station. *Gas Age 121,* 37 (1958) Apr. 3 (6 pp.); **Push-Button Compressor Station Ups Gas Flow.** *A.G.A. Monthly 40,* 24 (1958) Apr. (3 pp.)

New push-button controlled compressor station in West Virginia, servicing Ohio, Pennsylvania, New York and Virginia, has increased the flow of gas from two underground storage fields of the Hope Natural Gas Co. by 10 billion CF a year.

LPG Transportation

LPG Transportation Trends. *Gas Age 121,* 21 (1958) Apr. 3 (5 pp.)

Total shipments have increased from 4,477,000,000 gal to 6,636,000,000 over the last five-year period. Greatest volume is carried by tank truck, but pipeline shipment has had largest percentage gain.

Maintenance

Preventive Maintenance for Pipeline Systems. K. Henderson, H. Hollon and K. W. Richardson. *Gas Age 121,* 32 (1958) Mar. 20 (6 pp.)

Three experts present their viewpoints on maintenance as it applies to pipeline and gathering systems. Their discussions present in effect the what, when and why of maintenance, including specific methods, timing and scope of programs, and the problems which proper maintenance procedures can solve.

Pipelines

NGPL Co.'s Gas Put Wiseco's $4 Million Plant on Stream. I. Stemmer. *Pipe Line News 30,* 30 (1958) Mar. (2 pp.)

Pipeline stretching from Bridgeport, Tex., to Carter County, Okla., carries gas over 90 miles of a 350-mile cross county system known as the Oklahoma extension. After extending northward through a portion of Oklahoma, the 20-in. line turns westward, increasing in size to 26-in. pipe, traversing a distance of 260 miles. It crosses back into the Texas Panhandle area and connects with NGPL's main line near Amarillo.

TGT Files New Plans. *Oil Gas J. 56,* 92 (1958) Mar. 24.

Midwestern Gas Transmission Co. is seeking a Federal Power Commission permit to construct a $45 million pipeline for the Chicago-Gary area by January 1, 1959. Company proposes to lay a 30-in. line between Portland, Tenn. and Joliet, Ill. to move 260 million CF of natural gas daily. Peoples Gas, originally opposed to purchase of gas from Midwestern, has received assurance that the latter company would not oppose eventual construction of "Beatrice" project. This project has been postponed because of the Memphis decision.

Lake Superior Cities Get Alberta Gas. *Gas Age 121,* 17 (1958) Mar. 6 (3 pp.); **Lakehead Gets Gas.** *Can. Gas J. 51,* 16 (1958) Mar.; **Delivery of Alberta Gas to Lakehead Cities a Reality.** *Petrol. Eng. 30,* D-66 (1958) Mar.

Fort William and Port Arthur tied into the Trans-Canada Line on Jan. 30. Plans for 1958 include work on the 853 miles of pipeline which will reach as far east as Montreal.

River Crossings

Kenora Crossing a Tough One! L. O. Rowland. *Petrol. Eng. 30,* D-24 (1958) Mar. (3 pp.)

Operating loop for the most difficult dual-line water crossing on what will be the longest natural gas pipeline in the world was completed in four months under the triple channel of Winnipeg River near Kenora, Ontario. Line is being built by Northern Ontario Pipe Line Crown Corporation under private contracts, and is expected to be completed next fall.

6. GAS AND LPG STORAGE

Gas Holders

Storage of Liquefied Gases. H. A. Neuman. *Erdol u. Kohle 11,* 89 (1958) Feb. (6 pp. German text.)

Review of design factors of spherical gas holders includes metal properties, plate geometry, welding, construction codes and standards, number of units installed and auxiliary equipment.

Liquefied Methane

Louisiana Gas May Move to Europe. *Oil Gas J. 56,* 52 (1958) Mar. 31; **FPC Gets Constock Plan.** *Oil Gas J. 56,* 112 (1958) Apr. 7.

Detailed plans for proposed liquid-methane loading facilities in South Louisiana have been filed with U.S. Army Engineers by Constock Liquid Methane Corp. Similar plans, previously approved by the Calcasieu Parish police jury, led to speculation that Gulf Coast gas field may supply methane for initial shipments to Europe in liquid form.

Logging

LPG-Storage Well Logging. R. F. Sippel and H. D. Hodges. *Petrol. Eng. 30,* B-118 (1958) Apr. (3 pp.)

Inexpensive instrument, a simple Gamma-ray logging tool, yields accurate LPG-salt water interface, promises to be multipurpose tool for routine use at storage site.

LPG Storage

Atlanta Gas Light to Expand LP-Gas Storage Facilities by Nearly Four Million Gallons. *Gas Age 121,* 16 (1958) Mar. 20 (2 pp.)

Plans to expand its LPG storage facilities by 3,754,000 gallons have been made by the Atlanta

Gas Co. These plans call for the construction of two additional tanks at the company's Riverdale plant, each with a capacity of 1,352,000 gallons; nine new tanks at the Jonesboro unloading station, plus 26 tanks at the facilities in Rome, Macon and Augusta, all with capacities of 30,000 gallons each.

Underground Storage

Chicago Adds Another Underground Storage Field. *Gas Age 121,* 37 (1958) Mar. 6 (3 pp.)

Injection and withdrawal capacities of about 25 million CF a day will enable this new facility at Cooks Mills to increase number of days on which peak-day amounts of gas can be delivered from storage.

7. MANUFACTURED GAS AND CHEMICAL PROCESSING

Acetylene

Newest Acetylene Process from Japan. S. Tsutsumi. *Petrol. Refiner 37,* 169 (1958) Mar. (3 pp.)

New acetylene process gives good yields from a variety of hydrocarbon feed stocks and offers advantages over present partial oxidation processes. Based primarily on methane, acceptable yields are obtained even from butane. Operating variables are discussed for several raw materials.

Production of Acetylene from Natural Gas. B. S. Grinenko and V. B. Berkovich. *Gasovaya Prom. 12,* 26 (1957) (6 pp. Russian text.)

Review and comparison of the electric-arc, thermal pyrolysis and oxidation pyrolysis processes for production of acetylene from natural gas. Energy requirements and typical product gas analyses are given. Reaction furnace described in detail for new modification using CH_4 and O_2 in a high velocity turbulent gas stream. J. W. Penney

Ammonia

Ammonia from Fuel Oil. *Can. Chem. Processing 42,* 64 (1958) Mar. (4 pp.)

Millhaven, Ontario, is site of new $9 million anhydrous ammonia plant of Canadian Industries, Ltd. For the synthesis of anhydrous ammonia, pure hydrogen and nitrogen are combined in required 3:1 ratio and added to synthesis gas recycling through a catalytic converter which operates at 300 atm pressure. Hydrogen is generated by reaction of fuel oil with oxygen using the "Texaco" partial oxidation process and nitrogen is produced in a conventional air separation unit.

Simultaneous Distillation of Ammonia and Separation of Copper from Nickel-Bearing Solutions. V. N. Mackiw, R. L. Benoit, R. J. Loree and No. Yoshida. *Chem. Eng Progress 54,* 79 (1958) Mar. (7 pp.)

Description of process, starting from laboratory work to pilot plant and eventually to design and operation of commercial units, is of interest to gas industry because of ammonia use and handling and because of sulfur reactions in recovery of metals.

Carbon Electrodes

Making Giant Electrodes: Problems Magnified, Too. *Chem. Eng. 65,* 128 (1958) Apr. 7 (4 pp.)

Giant submerged arc furnaces—with power ratings at levels once considered impractical—are catching on in industry because of availability of giant electrodes.

Carbonization

Newcastle Gasworks, New South Wales. *Coke and Gas 20,* 96 (1958) Mar. (6 pp.)

Growth of Newcastle Gas and Coke Co. Ltd. from 1865 and construction and expansion of its Clyde St. works since 1910 are outlined. Plant of Glover-West vertical retorts (last 24 completed in 1955) produces about 7 million CF/day from the Maitland coals of New South Wales.

Operating Results at the New Swan Village Gasworks. J. R. Kilvert. *Gas J. 293,* 543 (1958) Mar. 12 (6 pp.)

Report of 4½-year operation of Swan Village gasworks which has a carbonizing plant comprising 64 82-in. lambent heated continuous vertical retorts, constructed with a continuous vertical taper, and arranged as four independent benches, each consisting of 16 retorts. Interesting note: during the September quarter, 1956, no fewer than 71 different types of coal with swelling numbers ranging from 2-8 were received.

Carbonizing Reactions

Rates of Reaction in the Carbonization Process. G. R. Oxley and G. J. Pitt. *Fuel 37,* 19 (1958) Jan. (6 pp.)

Apparatus for isothermic carbonization of coal was used to study formation of chloroform-soluble material during carbonization. Results show that the rate of formation is much higher than the rate of development of fluidity in the coal.

Catalysts

Raney Cobalt Hydrogenation Catalysts. II. The Physical and Chemical Properties of the Catalyst.

B. V. Aller. *J. Appl. Chem. 8,* 163 (1958) Mar. (5 pp.)

Study has been conducted of some of the more important physical and chemical characteristics of active Raney cobalt hydrogenation catalysts. They have properties very similar to those reported for Raney nickel, but their activity is generally lower than that of the latter.

CO_2 Removal

New Agitator Absorber for CO_2. A. S. Moore and S. Katell. *Petrol. Refiner 37,* 163 (1958) Mar. (6 pp.)

Report of studies undertaken to determine characteristics of agitator-absorber with respect to 1) process; 2) carbon dioxide content of feed gas; 3) absorbent solution rate and 4) liquid-to-gas ratio.

Coal

The Dewatering of Fine Coal. V. R. Gray. *J. Inst. Fuel 31,* 96 (1958) Mar. (13 pp.)

New laboratory technique for investigating the dewatering of fine coal consists of applying increments of suction to the saturated coal bed and measuring water removed at equilibrium for each increment. From these data a pore size distribution for coal can be obtained. This approach emphasizes size distribution of pores in the bed rather than that of coal grains, and it enables the two to be related.

Chemistry of Brown Coals. J. D. Brooks, R. A. Durie and S. Sternhell. *Australian J. Appl. Sci. 9,* 63 (1958) Mar. (18 pp.)

Infrared spectra of Victorian brown coals indicate the presence of hydrogen-bonded hydroxyl, aliphatic CH, and carboxylic carbonyl groups, and possibly aromatic ring structures and ether groups. Chemical modifications occurring in the determination of functional groups are reflected in most cases in expected changes in infrared spectra, but methylation produces changes which show that keto-enol structures may be contributing to the intense 1600 cm^{-1} band in brown coals. The spectra of methylated and acetylated coals indicate that nonreactive hydroxyl groups may be present.

Coal Hydrogasification

Fluid-Bed Pretreatment of Bituminous Coal and Lignite. Direct Hydrogenation of Chars to Pipeline Gas. K. C. Channabasappa and H. R. Linden. *Ind. Eng. Chem. 50,* 637 (1958) Apr. (8 pp.)

To determine the type of coal pretreatment needed to produce nonagglomerating, reactive chars for fluid-bed hydrogenation to pipeline gas, fluid-bed pretreatment of low-rank coals in various atmospheres was investigated in a bench-scale unit at atmospheric pressure and maximum temperatures of 400°-720° F. Optimum pretreatment temperature was 600°F for bituminous coals and 500°F for lignite. Agglomeration of high-volatile bituminous coal was greatly reduced after pretreatment in air or nitrogen. High yields of pipeline gas containing 70-80 mole % of methane plus ethane were obtained at 1350°F.

Dry Coke Cooling

Dry Coke Cooling. I. A. R. Myhill. *Coke and Gas 20,* 102 (1958) Mar. (5 pp.)

Use of steaming with vertical retorts and more complete description of the Collin inert-gas coke cooling system are given in Part I.

Ethylene

High-Temperature Pyrolysis of the Ethane Fraction for the Purpose of Obtaining Ethylene. P. S. Kogan and L. A. Potolovskii. *Khim. Tekh. Top. Masel 3,* 25 (1958) No. 1 (8 pp. Russian text.)

Laboratory experiments on pyrolysis of a fraction containing 83-92% ethane, 5-14% propylene and 0.6-1.7% ethylene in tubes of quartz, chrome-nickel steel and an iron-chrome-aluminum alloy at 800-950° C and atmospheric pressure are described in detail. Optimum ethylene yield 62%, based on fraction used, 84% basis reacted ethane and propylene. Assoc. Tech. Services, Inc.

Gasification

A Study of the CO Conversion Reaction During Steam Gasification of Carbon. N. V. Lavrov and G. V. Grebenshchikova. *Gasovaya Prom. 1,* 20 (1958) (6 pp. Russian text.)

In order to obtain information leading to increased hydrogen content in the gasification process, carbon-steam-air, the conversion reaction, $CO + H_2O \rightleftarrows CO_2 + H_2$, in the presence of carbonaceous fuels, was studied on a laboratory scale to determine the effect on the conversion reaction of 1) nature of fuel, 2) temperature and 3) H_2 and CO_2 content of initial gas. Authors conclude that rate of conversion depends on surface area of fuel and chemical composition of ash; coke is a better catalyst (0.36 conversion at 800°C) than electrode carbon (0.07 conversion at 800°C), and that conversion is retarded by CO_2 or H_2 in original gas mixture.

J. W. Penney

Effect of Carbon Dioxide Concentration on Gasification of Artificial Graphite. P. V. N. Ramachandra Rao and E. E. Petersen. *Ind. Eng. Chem. 50,* 331 (1958) Mar. (6 pp.)

Reaction isotherms and bulk density profiles were determined for 10-g graphite cylinders reacted to weight losses of 0.5, 1.0, 1.5 and 2.0 g at carbon dioxide partial pressures of 0.25, 0.50, 0.75 and 1.00 atm. A total pressure of 1 atm was maintained using helium as a diluent. Extent of the reaction at various points in the interior of the graphite rods was determined by comparing the bulk density profiles of reacted and unreacted samples.

Progress Review No. 40: The Complete Gasification of Coal. F. C. Wood. *J. Inst. Fuel 31,* 55 (1958) Feb. (8 pp.)

Recent economic background of complete gasification is reviewed by processes, outputs and countries, followed by sketches of techniques (especially producer and water gas) and reviews of high-Btu city gas and of synthesis gas.

Gas-Oil Evaluation

A Review of Modern Oil Gas-making Methods. A. S. Taylor and G. Milner. *Gas J. 293,* 639 (1958) Mar. 26 (8 pp.)

Processes considered include thermal cracking in steam, thermal cracking in hydrogen atmosphere, catalytic cracking in steam and partial oxidation. Theory of reactions and product formation and influence of feed composition, atmosphere and temperature are outlined. Commercial results on Semet-Solvay (Power-gas Corp. Ltd.) and on catalytic and Texaco designs are discussed.

Fuel Oil Cracking. M. A. Spaggiari. *Coke and Gas 20,* 124 (1958) Mar. (4 pp.)

Composition of gas-making oils by hydrocarbon type and the pyrolytic decomposition of these types. Estimation of gas-making quality by the C/H ratio, specific gravity-hydrogen relation; viscosity-gravity constant, Conradson carbon influence and the Griffith laboratory gasification test are discussed.

Hydrogenation

Heats of Hydrogenation. VI. Heats of Hydrogenation of Some Substituted Ethylenes. R. B. Turner and D. E. Nettleton, Jr. *J. Am. Chem. Soc. 80,* 1430 (1958) Mar. 20 (6 pp.)

Heats of hydrogenation of 10 substituted ethylenes were measured in acetic acid solution at 25°. Article describes compounds included in this investigation and the ΔH values (kcal/mole) obtained.

Methanol

Results of Combining Methanol Synthesis with Destructive Hydrogenation. I. A. Makarov and V. M. Nizyaev. *Khim. Tekh. Top. Masel 3,* 9 (1958) No. 1 (9 pp. Russian text.)

Flow sheet and operating data are given for methanol synthesis combined with liquid- and vapor-phase hydrogenation of tars and coal with intermediate cuprammonium purification. Components of product gases are given. Plant, which produced 100,000 metric tons of methanol without a change of catalyst in this arrangement, greatly reduced capital and operating expenses, also eliminating need for thorough CO conversion.

Assoc. Tech. Services, Inc.

Motor Fuels

Introducing: Alkar and Butamer. H. W. Grote. *Oil Gas J. 56,* 73 (1958) Mar. 31 (4 pp.)

Butaimer process shows promise of filling the need for efficient and economical conversion of normal butane to isobutane with a minimum capital investment. Alkar process, on a scale previously impossible, utilizes by alkylation the light olefin content of the refiner's fuel gas.

Oil Shale Extraction

Thermal Extraction and Solution of Oil Shale Kerogen. W. R. Thompson and C. H. Prien. *Ind. Eng. Chem. 50,* 359 (1958) Mar. (6 pp.)

To further define the structural properties of organic matter (kerogen) in oil shale and the relationship between organic matter and inorganic matrix, additional thermal solution studies were conducted. Tetralin was employed as solvent, in the range 220°-400°C. Degree of kerogen degradation increased with increasing temperature and decreasing organic content. The enthalpy change for the solution process increased with both shale organic content and extraction temperature. Results indicate that the organic-inorganic bonding forces predominating in lean shales are probably weaker than the organic-organic bonds predominating in rich shales. It is suggested that the mechanism of kerogen formation in shale involves both endothermic and exothermic reactions.

Ore Reduction

Iron Powder Made by the H-Iron Process. J. F. Kuzmick and K. W. Bruland. *Metal Progress 73,* 92 (1958) Mar. (5 pp.)

Magnetite concentrate of high purity is reduced by hydrogen (97% purity) at 400 psi and 1000°F, and reheated in protective gas to 1500°F to prevent reoxidation. Hydrogen is made from coke oven gas. Various grades of iron powder are suitable for molding, for a chemical reagent, and for high-grade melting stock. (H10c; Fe)

Organic Sulfur

Catalytic Desulphurising Plant at Jersey. *Gas J. 293,* 595 (1958) Mar. 19 (4 pp.)

New plant for catalytic sulfur removal installed at Jersey is capable of processing up to 40 million CF/day of what would normally pass for town gas with an organic sulfur content of about 35 grains/100 CF, free from hydrogen sulfide. Plant may be divided into three main parts—the preheating of gas before it comes in contact with the catalyst, the catalyst vessel followed by cooling of the processed gas, and the catalyst regeneration plant. Foldout drawing is included.

Petrochemicals

Petrochemicals via the Oxo Process. P. W. Sherwood. Part I. Products of the Oxo Process and their Markets. *Petrol. Eng. 30,* C-16 (1958) Feb. (3 pp.); Part 2. Technology of the Oxo Reaction, Production of Aldehydes and Alcohols. *Ibid.,* C-26 (1958) Mar. (5 pp.)

Versatility of Oxo chemicals reaction permits the use of a large variety of feedstock hydrocarbons and several derivatives are obtainable from a given starting material. Main course of the Oxo reaction yields two isomeric aldehydes by the addition of carbon monoxide. Conversion is effected, normally, in the liquid phase in the presence of cobalt catalyst. Operating pressure is 3000-4500 psi at a temperature of 145°-200°C.

Petroleum

The Chemistry of Lubricating Oil and Fuel Additives. D. P. Dodgson. *Petrol. 21,* 119 (1958) Apr. (6 pp.)

Summary of some current knowledge of the nature of chemicals which are used to improve the properties of lubricating and fuel oils. For descriptive purposes, additives are grouped into those used for combustion engine lubricants, hypoid gear lubricants, industrial lubricants and fuels. References are made to sources of more detailed information on particular aspects.

Petroleum Properties

Selected Crude Evaluation Charts. *Oil Gas J. 56,* 110 (1958) Mar. 24 (46 pp.)

Crude evaluation charts and tables of data for 47 selected crudes, both domestic and international. Listing of yields and properties of products includes 20 domestic, four Canadian, nine Venezuelan, eight Middle Eastern, two European, one African and three Far Eastern crudes.

Refining Capacity

Domestic Refining Capacity is Leveling Off. G. Weber. *Oil Gas J. 56,* 88 (1958) Mar. 24 (4 pp.)

Crude capacity rose only 1.2% in 1957, which is regarded as a favorable trend because of top-heavy position of potential over demand. New crude capacity is being added but most of it is offset by a rising retirement rate for older facilities. During 1958, trend evident in 1957, that of upgrading processing facilities, will continue at a fairly rapid pace.

Sulfur Recovery

Production of Sulfuric Acid by the Wet Catalyst Method. S. A. Dzhobadze and E. Rudinski. *Gasovaya Prom 1,* 16 (1958) (4 pp. Russian text.)

Detailed description of sulfuric acid plant at Shchekinsk gas plant where regenerator gas from a monoethanolamine purification plant containing 6% H_2S and 93% CO_2 is processed to 93.5% sulfuric acid by the wet catalyst method. Gas is burned with added air to convert H_2S to SO_2; is passed through a heat exchanger where it is cooled from 680°C to 460°C; is passed through a catalyst chamber where SO_2 is oxidized to SO_3 (3%) and then enters a horizontal condenser where sulfuric acid is formed by the condensation of water vapor along with the SO_3. Sulfuric acid is withdrawn from condenser, gas is passed to moisture eliminator and then to electro-filter. Outlet H_2SO_4 is less than 0.2 g/m³. J. W. Penney

Synthetic Liquid Fuels

Report on Pilot Plant Synthesis of Liquid Fuels. C. Ta-Yu, L. Nan-Tsuen and C. Chun-Hao. *Chem. Eng. Progress 54,* 55 (1958) Mar. (4 pp.)

Report of process research on synthetic liquid fuels at the Institute of Petroleum, Academia Sinica, China. Article deals particularly with practicability of synthesis of liquid fuels from carbon monoxide and hydrogen by use of iron nitride and cobalt catalysts.

Tar Formation

The Formation of Coal Tar during High-Temperature Carbonization of Bituminous Coals. F. Rosendahl. *Gas- u. Wasserfach 99,* 2 (1958) Jan. 3 (11 pp. German text.)

Comprehensive review of 25 years of work by specialists in this field updates knowledge of carbonization and associated processes and conditions of tar formation.

Water Gas

Good Results from New Plant at Oyster Cove. *Nat. Gas. Bull. 22,* 6 (1958) Feb. (3 pp.)

Need for increased plant capacity in 1958, increased

flexibility to handle increasing peak load incident and for improved working results prompted the North Shore Gas. Co. Ltd. to choose a carburetted water gas plant. Automatically operated installation has a daily capacity of more than 2 million CF of 512 Btu gas.

Acetylene

Process and Apparatus for Pyrolysis of Hydrocarbons. S. P. Robinson (assigned to Phillips Petroleum Co.) U.S. 2,823,243 (1958) Feb. 11.

Improved yields of acetylene by pyrolysis are claimed by injecting centrally a preheated stream of natural gas within an annular blanketing flow of combustion gases (oxy-hydrogen) mixing in a Venturi chamber at 2400°-3500°F, adding a quenching fluid and rapidly cooling to 500° F in a second, right-angle Venturi chamber.

Carbon Black

Apparatus for Producing Carbon Black. N. D. Steele (assigned to G. L. Cabot, Inc.) U. S. 2,825,633 (1958) Mar. 4; **Process of Making Furnace Carbon Black and Burner Therefor.** N. D. Steele (assigned to G. L. Cabot, Inc.) U.S. 2,825,632 (1958) Mar. 4.

Carbon black furnace comprises a lower air-fed throat, a central burner comprising outer annular gas fuel pipes and an inner oil injection pipe with spray feed. Gas fuel pipes discharge through multiple radial orifices, mixing with air to burn completely in the throat, the hot gases then rising to meet the oil spray at a level 6-22 in. higher.

Flue Gases

Flue Gas Purification System. R. L. McIlvaine (assigned to H. Simpson Corp.) U.S. 2,826,264 (1958) Mar. 11.

Stack is fitted at a lower level with a venturi pipe which permits withdrawal of stack gases through an adjacent scrubber-tower purifier by a suction fan, which then discharges washed gases back into the stack at a higher level.

Gas Liquefaction

Process for Separating a Compressed Gas Mixture. R. Linde (assigned to Ges. fur Linde's Eismaschinen AG.) U.S. 2,825,212 (1958) Mar. 4.

In a process for separating a compressed gas mixture, the ingoing mixture is partly cooled by indirect heat exchange with outgoing separated products. The remaining impurities are removed with an absorption material; then part of this purified stream is used, with reheating, compressing and recooling, to obtain regulation of the rest of the compressed stream.

Hydrogen Separation

Method of Separating Hydrogen from Hydrogen-Containing Gases. D. D. MacLaren (assigned to Esso Research and Eng. Co.) U.S. 2,822,888 (1958) Feb. 11.

Fluidized beds of molybdenum oxide on alumina which also carry 1-5% carbonaceous material are used at 500-1000°F and from 0-1000 psig to absorb hydrogen from a gaseous mixture; hydrogen is recovered by steam stripping.

Oxygen Removal

Removal of Oxygen or Hydrogen from Gases. T. J. Webster (assigned to British Oxygen Co. Ltd.) U.S. 2,826,480 (1958) Mar. 11.

Inert gas containing either hydrogen or oxygen is purified by adding stoichiometric amounts of the other (oxygen or hydrogen) and converting the mixture to water in a catalytic reactor, the gas addition being controlled automatically by an impurity detector on the outlet gas.

Solid CO-H Polymers

Preparation of Normally Solid, High Molecular Weight, Hydrocarbon Polymers with Reduced Phosphomolybdic Catalysts. H. R. Arnold, F. S. Fawcett and W. W. Gilbert (assigned to E. I. du-Pont deNemours and Co.) U.S. 2,825,704 (1958) Mar. 4.

Process is claimed for preparing solid, high molecular weight hydrocarbon polymers by reacting hydrogen and carbon monoxide over a reduced phosphomolybdic acid catalyst at 200 atm and 150°-275°C.

8. GAS DISTRIBUTION

Compressors

New Head Station Boosters for Mortlake Works of Australian Gas Light Company. N. G. Mather. *Gas J. 293,* 534 (1958) Mar. 12 (2 pp.)

Facilities for distributing gas to the area served by the Australian Gas Light Company have been strengthened by the completion and commissioning of two steam turbine driven gas boosters.

Network Analyzer

Pipeline Analyzer. P. C. Constant. Part 1. **Pipeline Analyzer Speeds Flow Computations.** *Oil Gas. J. 56,* 82 (1958) Mar. 31 (3 pp.); Part 2. **Pipeline Analyzer Outlines Gas-Gathering System.** *Ibid.,* 160 (1958) Apr. 21 (5 pp.)

Developed to eliminate the cumbersome Hardy-Cross computations required in studies of flow and pressure distributions in complete pipeline networks, this analytical tool is now being used for numerous studies for both constant and variable-density fluid-flow piping systems. Part 2 takes up a specific study of a gas-gathering system, and outlines other uses of the computer at Midwest Research Institute.

Odorization

Odorization of an Integrated Gas System. A. F. Kyhos. *Gas 34,* 76 (1958) Apr. (4 pp.)

Review of the experience of one gas company in the odorization of natural gas as well as the development of odor-testing practices.

Pressure Regulation

Some Notes on Gas Governors. H. E. Shaw and M. W. Jeavons. *Gas J. 293,* 550 (1958) Mar. 12 (4 pp.)

Facts relative to design and manufacture of gas governors from small units as fitted to appliances to large district governors, both high and low pressure. Appliances utilizing governors included cookers, fires and water heaters, while volumetric governors were installed to feed various holder stations from high pressure network, and holder valves fitted to automatically shut off gas supply.

Regulators

Flexibility, Automation in Regulator Station Design. E. Roark. *Gas 34,* 73 (1958) Apr. (3 pp.)

New regulator station in southwest Denver employs automatic controls to supply gas to a portion of Denver gas system and western suburbs. Regulating equipment is housed in subgrade room.

Telemetering

Computed Flow Telemetering. *Gas 34,* 86 (1958) Apr. (3 pp.)

United Gas Improvement Co. services four major divisions: Harrisburg Gas Division, Lancaster County Gas Division, Reading Gas Division and Lehigh Valley Gas Division. Centralization of flow information from each division's dispatching and distribution facilities makes it possible for UGI to peak shave efficiently.

Weather vs Demand

Research on the Temperature Dependence and Development Trend of Gas Sales of 25 Cities in the German Federal Republic. W. Wunch, F. Tuppeck and H. Plett. *Gas- u. Wasserfach 99,* 201 (1958) Feb. 28 (6 pp. German text.)

Data accumulated since January 1954 on gas sales was correlated statistically with average monthly temperatures for customer groups and for total consumption. Tables and graphs are included.

9. GAS FUEL UTILIZATION AND APPLIANCES

Air Conditioning

Building Profitable Summer Load. J. R. Shipman. *Gas Age 121,* 19 (1958) Mar. 6 (3 pp.)

Aggressive promotion of gas air conditioning in 1956 resulted in the addition of 27 tons to the lines of Oklahoma Natural Gas Co. by the end of the year. Total tonnage now has reached 34,178, and additional annual revenue has climbed to more than $250,000. Steps to selling include warehousing, dealer education, employee inducements, close inspection.

How to Make the Most Effective Use of Psychrometric Charts. M. A. Ramsey. *Refrigerating Eng. 66,* 31 (1958) Apr. (5 pp.)

As guides to the specification of air conditioning and refrigeration equipment, psychrometric charts provide rapid reference to humidity and temperature interrelationships and, properly applied, speed the accurate evaluation of preliminary work, alternate possibilities and final recommendations.

Why We Chose Gas Systems for Air Conditioning. H. C. Stuckeman. *Ind. Gas 36,* 5 (1958) Mar. (3 pp.)

Available data convinced one company that gas air conditioning employing absorption type equipment is the best choice. Since installation, this company has obtained better workmanship quality because of the absence of wide fluctuations in temperature of tools, fixtures and parts to be machined. Elimination of rusting has enabled inventory and equipment savings. Cost data are cited.

Appliances

How Long Do Appliances Last? C. M. Jaeger and J. L. Pennock. *Gas Age 121,* 27 (1958) Mar. 6. (2 pp.)

Report of a survey conducted by the Bureau of Census for the Institute of Home Economics from a national sample of approximately 17,500 households to determine how long pieces of household equipment are currently being kept in homes. From resulting age distribution of items in the inventory at the time of the survey and of items discarded in the previous year, actuarial tables modeled after those used by life insurance companies were constructed.

Burner Controls

Automatic Range Top Temperature Controls. C. E. Smith. *Gas 34,* 82 (1958) Mar. (2 pp.)

Geared for servicemen, article describes function and proper operation of automatic controls.

Flame Research

A Contribution to Flame Theory. F. Klein. *Appl. Mech. Rev. 11,* 142 (1958) Mar. (From *Phil. Trans. Roy. Soc. Lon. 249,* 389 (1957) Feb. (27 pp.))

Author reviews briefly the equations of reacting gas mixture and their application to flames. A one-dimensional flame model is considered and a general solution is attempted.

(From) W. Jost

Observations on the Kinetics of the Ionization of Alkali Metals in Flame Gases. P. F. Knewstubb and T. M. Sugden. *Trans. Faraday Soc. 54,* 372 (1958) Mar. (9 pp.)

Ionization of alkali elements in flame gases has been investigated under conditions such that effects due to the kinetics of the processes are discernible. The results are interpreted in the light of the mechanism proposed by Page and Sugden. An original apparatus for the measurement of electron concentrations in flames is described.

Some Recent Developments in the Physics of Fuel Combustion. M. W. Thring. *Appl. Mech. Rev. 11,* 142 (1958) Mar. (From *Brit. J. Appl. Phys. 8,* 89 (1957) Mar. (9 pp.))

Author cites many-fold differences between heat-release rates attained in experimental well-stirred combustion chambers and rates common to industrial practice, to emphasize point that performance of practical systems is limited not by chemical processes but by physical ones of mixing and heat loss from the flame. (From) P. Jensen

Temperature Determination in Flames by X-Ray Absorption Using a Radioactive Source. G. J. Mullaney. *Rev. Sci. Instruments 29,* 87 (1958) Feb. (5 pp.)

Radioactive source Fe^{55} was used to measure the density of high-temperature combustion products through a flame zone 6.5 cm long. Premixed propane-oxygen and argon were used for the experiments with a porous metal burner. Temperatures were determined downstream of the main reaction zone in the flame at one atmosphere. Temperature profiles were obtained through the preheat and main reaction zone using radioactive Fe^{55} coated on a small platinum wire as a line source.

Gas Turbines

Gas Turbines. W. E. Locher, A. E. Olson and P. P. Nibley. *Pipe Line News 30,* 34 (1958) Mar. (7 pp.); **Unattended Turbine Stations on Tapline.** W. E. Locher et al. *Oil Gas J. 56,* 125 (1958) Apr. 7 (8 pp.); **Gas Turbines in the Arabian Desert.** W. E. Locher et al. *Mech. Eng. 80,* 81 (1958) Apr. (4 pp.); **Tapline Boosts Capacity with Turbines.** W. E. Locher et al. *Pipe Line Ind. 8,* 43 (1958) Apr. (9 pp.); **Trans-Arabian Pipeline Capacity Soon to Reach 460,000 Barrels Daily.** *World Petrol. 29,* 51 (1958) Apr. (3 pp.)

Trans-Arabian Pipeline Co. now has six new pumping units, driven by 5000-hp combustion gas turbines, in operation. These units, together with original pumping equipment, provide power to move 450,000 bbl/day of crude oil a distance of 754 miles through a 30-31 in. pipeline from Qaisumah, Saudi Arabia, to a tanker-loading terminal on the Mediterranean coast near Sidon, Lebanon. Both portable prefabricated units, for unattended intermediate sites, and permanently installed units at existing stations have been employed.

Operating Experience with 750/1000-KW Gas Turbines. G. B. R. Feilden and T. P. Latimer. *Combustion 29,* 47 (1958) Mar. (6 pp.)

Operation of 29 Mark TA turbines of medium power design now in service has been characterized by complete freedom from blade breakages or other major failures. Summary of experience is presented and integration of the turbine with packaged assisted-circulation boilers in order to provide compactness and flexibility of output is discussed.

Heat Treating

American Practice in Heat Treating with Gas. T. A. Dickinson. *Ind. Gas (British)* 14 (1958) Mar. (2 pp.)

Comparison of best of gas and electrical furnaces that may be used in heat treatment of aluminum led one Southern California treating company to employ gas heaters of the type that obtains intake air with blowers and allows combustion products to escape via rooftop vents. Result: better circulation than is usually attainable with electrically heated furnaces.

Combination Gas and Electric Heating in Rotary Hearth Furnace for Treating High-Speed Steel Bearing Rings. *Ind. Heating 25,* 496 (1958) Mar. (3 pp.)

New furnace for processing high speed type steel ball bearing rings is used primarily by the aircraft industry in unusual high temperature applications. This material requires a preheat at temperatures ranging from 1400°-1700°F, followed by a high heat ranging from 2000-2400°F.

Industrial Gas

When Natural Gas Came to Charlotte. A. Q. Smith. *Gas Age 121,* 22 (1958) Mar. 6 (3 pp.)

When natural gas was introduced to Charlotte, N.C., it was distributed to 34,000 customers, none of which could be classified as an industrial plant. Six years of aggressive salesmanship have cultivated 124 industrial customers.

Industrial Heating

Industrial Stoving Equipment for High-Quality Finishing. *Ind. Gas* (British) 9 (1958) Mar. (13 pp.)

Applied heat must be absolutely controlled for all stoving of finishes. Gas-fired equipment of either convection or radiation type insures maintenance of a high standard of production at reasonable cost.

Reconditioning Steel Drums at Crossroads of Industry. C. Ackerson. *Ind. Gas 36,* 2 (1958) Mar. (3 pp.)

New Jersey, a center for drum reconditioning work, has a capacity of 25,000/day. One of the largest plants in the area uses gas to speed up work and assure quality.

Industrial Ovens

Multi-tray Oven for Low Temperature Heating of Solids. *Gas World 147,* 46 (1958) Mar. 15.

Oven consists of a cubical insulated box, constructed from mild steel sheet, surrounded by a polished aluminum case with a space left between the two through which air may circulate for insulation purposes. Upper portion is divided vertically to house two tiers of three trays each, which hold material to be heated. Combustion chamber extends horizontally across lower portion into which the burner fires at an angle from the bottom left-hand corner.

LPG Uses

Gas vs. Electric Fork Trucks—Facts and Fiction. D. Reber. *LP-Gas 18,* 42 (1958) Apr. (8 pp.)

Point by point repudiation of some of the promotional material used to sell electric in-plant trucks over LPG units.

Pilot Lights

Pre-formed Aluminum Tubing Solves Service Call Problem for Peoples Gas. T. A. Zamirowski. *Am. Gas J. 185,* 18 (1958) Apr. (2 pp.)

Lightweight, strong precut aluminum is being used by The Peoples Gas Light and Coke Company, Chicago, to replace clogged flaking pilot tubings in gas water heaters, space heaters and some central heating plants.

Radiant Heat Exchange

Radiant Heat Exchange in a Gas-Filled Enclosure. H. C. Hottel and E. S. Cohen. *Appl. Mech. Rev. 11,* 139 (1958) Mar. (From ASME-AIChE Heat Trans. Conf., 1957. Paper 57-HT-23 (36 pp.))

A method is presented for calculating the temperature and heat transfer in a furnace, taking radiation exchange into account. The system is divided into surface zones and gas zones, sufficiently many to give the desired accuracy. Using available direct-exchange factors, the net-exchange factors for any zone pair can be computed, allowing for interaction with all other zones. The simultaneous solution of the resulting set of energy balances yields the desired distributions of temperature and heat flux.

H. D. Block

Radiant Heating

How to Design for Radiant Heating. L. M. Polentz. *Chem. Eng. 65,* 137 (1958) Apr. 7 (4 pp.)

Of all heat transfer techniques, radiation is the hardest to understand. Article reviews some of the basic fundamentals and describes some applications.

Space Heating

Economics of School Heating and Air Conditioning. Z. A. Marsh. *Heating, Piping & Air Conditioning 30,* 157 (1958) Apr. (4 pp.)

Importance of air conditioning in schools is emphasized. Increased teaching efficiency and learning ability are among benefits realized.

Pulsations in Residential Gas Furnaces with Multiple-Port Burners. A. A. Putnam. *Heating, Piping & Air Conditioning 30,* 143 (1958) Apr. (7 pp.)

Way in which oscillations in residential gas furnaces fired with multiple-port, ribbon or slot burners are driven is postulated. It is indicated that the general operating conditions leading to oscillation are a function of 1) the product of the natural frequency of the burner and the time lag of the burner flame, and 2) the ratio of the furnace frequency to the natural frequency of the burner. The extent to which these operating conditions favor oscillation is a function of the ratio of the acoustic driving input from primary combustion to the acoustic damping losses.

Burners

Internally Fired Gas Burner. J. L. Angel. U.S. 2,826,248 (1958) Mar. 11.

Burner for thawing frozen railway cars consists of a refractory-lined cylindrical case mounted horizontally on a stable base with its upper side surface perforated by flame ports and fired by a nozzle placed axially at one end of cylinder with gas or oil fuel and air under pressure.

Multiple Nozzle Gas Burner. A. J. Poole (assigned to Babcock & Wilcox Co.) U.S. 2,826,249 (1958) Mar. 11.

Burner is claimed comprising a wall burner-port with air supply and control shutter and an outside annular ring gas header from which are spaced circumferentially a series of gas conduits running through the port wall and terminating in conical burner tips.

10. EQUIPMENT AND INSTRUMENTATION

Combustion

Protective Devices for Burning Fuel Safely. E. E. Bedard. *Ind. Gas 36,* 12 (1958) Mar. (2 pp.)

Suggestions for preventing three most common causes of reported losses by combustion chamber explosion by proper equipment and maintenance.

Computers

Magnetic Record Analyzer. E. B. Tickell. *World Petrol. 29,* 64 (1958) Mar. (2 pp.)

All-electronic analyzer operates as continuous computer using analog principle.

Control Equipment

An Analysis of Chemical Reactor Stability and Control. R. Aris and N. R. Amundson. Part 1. The Possibility of Local Control, with Perfect or Imperfect Control Mechanisms. *Chem. Eng. Sci. 7,* 121 (1958) No. 3 (11 pp.); Part 2. The Evolution of Proportional Control. *Ibid.,* 132 (16 pp.); Part 3. The Principles of Programming Reactor Calculations. Some Extensions. *Ibid.,* 148 (8 pp.)

In this series, a well-agitated continuous reactor either of the liquid or fluidized variety is considered under various types of control and criteria are derived enabling the determination under what conditions different modes of control are successful. Part 1 discusses linear approximation and goes on to discuss the possibility of controlling a naturally unstable steady state by various systems of perfect and imperfect control. In Part 2, the behavior of the reactor through the variation of the control parameter is followed. The question of proportional control with very high amplification is discussed, in Part 3, in terms of the limiting form of off-on control. Extension is given to simultaneous reactions in more than one reactor and general conclusions are drawn.

Electrical Equipment

A Review of Explosion-Proof and Permissible Electrical Equipment. G. M. Kintz and H. F. Browne. *Gas Age 121,* 18 (1958) Mar. 20 (4 pp.)

Electrical installations in a hazardous area should be made in accordance with Article 500 of the National Electrical Code. Correct installation and maintenance of explosion-proof equipment are necessary. Care should be exerted to see that seals are installed correctly.

Heat Exchanger

Heat Exchange in a Spray Type Gas Water Heater. A. Yu. Irak. *Gasovaya Prom. 1,* 34 (1958) (5 pp. Russian text.)

Study was conducted of over-all space heat transfer coefficient K_0 (kilo cal/m^3 hr ^{0}C) for a spray type gas water heater with a maximum thermal input of 50 kilo cal/hr. A water jacket around combustion chamber absorbed 30-40% of heat input without contamination with combustion products. A water spray absorbed additional heat from flue products cooling them below their dew point. Heat exchange efficiencies for spray chamber were 92-95%. Values of K_0 were determined as a function of spray drop area, spray rate, size of spray chamber and thermal input. Maximum value of K_0=250 was obtained.

J. W. Penney

Instruments, Control

Instrument Panels Made for Easier Operation. J. D. Yanak. *Petrol. Refiner 37,* 224 (1958) Mar. (5 pp.)

With increasing tendency to gather and record more data about a process unit, control panels are becoming too cumbersome for simple operation. Article presents some methods to simplify the job for the operator.

Piping Design

How to Design Tower Piping. R. Kern. *Petrol. Refiner 37,* 136 (1958) Mar. (7 pp.)

This method treats towers as central pieces of equipment and extends design around this center. Step-by-step analysis assures saving of manpower and material.

How to Estimate Piping Labor. O. R. Roberts. *Petrol. Refiner 37,* 147 (1958) Mar. (3 pp.)

Use of flow sheet, piping specifications, plot plan or other piping drawings and bill of materials along with consideration of labor units, permits quick estimate of piping labor for any particular job.

More Piping PSI for Your Dollar. D. Christopher. *Petrol. Refiner 37,* 143 (1958) Mar. (4 pp.)

Cheapest or strongest piping materials are not necessarily the most economical. Allowable "S" is divided by relative cost of all Code materials enabling selection of optimum PSI a dollar can buy.

Tips for High-Pressure Piping. E. E. Ludwig. *Petrol. Refiner 37,* 155 (1958) Mar. (7 pp.)

Summary of factors to consider in designing high-pressure piping systems. Plant layout, construction and testing procedures are discussed. Although somewhat conservative, article has valuable information for those in high-pressure processing.

What Is Economic Pipe Size? C. J. Shelton, Jr. *Petrol. Eng. 30,* D-19 (1958) Apr. (7 pp.)

Article describes rapid method for determination of economic pipe diameter for a given set of conditions. In many cases, this method gives the final answer to the selection of economic pipe size. In others it will serve only as a guide, narrowing the range of diameters which must be studied in greater detail.

Pressure Gage

Operation of an Inverted-Magnetron Gauge in the Pressure Range 10^{-3} to 10^{-12}MM. Hg. J. P. Hobson and P. A. Redhead. *Can. J. Phys. 36,* 271 (1958) Mar. (18 pp.)

Cold-cathode gauge, with axial magnetic field and radial electric field, has the structure of an inverted magnetron with an auxiliary cathode which provides the initial field emission and allows the positive-ion current to be measured independently of the field-emission current. Operation and calibration of the gauge in a dynamic vacuum system is described for the pressure range 10^{-3}—$5x10^{-9}$ mm Hg.

Pyrometry

The Venturi Pneumatic Pyrometer. A. M. Godridge, R. Jackson, and G. G. Thurlow. *J. Sci. Instruments 35,* (1958) Mar. (8 pp.)

Instrument described can be used at higher temperatures than existing probe instrument and has a very rapid rate of response. Operation of instrument is discussed and examples of its use are given. In the downtakes of open-hearth furnaces and in water-tube boilers, the instrument shows advantages over the suction pyrometer in speed of response and freedom from blockage. Results have also been obtained at temperatures higher than those at which any other method of obtaining local temperatures has proved successful.

11. MATERIALS OF CONSTRUCTION, AND CORROSION

Cathodic Protection

A Method to Find Shorts in a Distribution System. T. Snedden. *Gas 34,* 77 (1958) Mar. (5 pp.)

Tester which uses the principle of induction of a known impressed a.-c. voltage across an insulator shows the actual condition of effectiveness of an insulating fitting in place regardless of conditions existing on adjacent services.

Cathodic Protection of an Old Uncoated Pipeline. D. P. Price and R. M. Wainwright. *Gas 34,* 119 (1958) Mar. (7 pp.)

Case history of the application of "hot spot" coating and cathodic protection to an old predominantly uncoated line, with author's statement that about same results and success can be achieved on most old bare lines provided that they are of sufficiently good condition to meet future pressure demands.

Cathodic Protection of Gas Pipelines. T. L. Canfield. *Gas Age 121,* 43 (1958) Mar. 6, (4 pp.)

Essential element of corrosion control, now considered an economic necessity in everyday operation, is cathodic protection, with insulation and coating combined to afford three-way insurance.

Cathodic Protection of Iron in the Temperature Range 25C-92C. G. R. Hoey and M. Cohen. *Corrosion 14,* 200t (1958) Apr. (3 pp.)

Cathodic protection of iron was investigated in the temperature range 25°-92°C. The limiting protective current density and the open circuit cathodic current density for iron in dilute NaCl solution goes through a temperature maximum at roughly 75°C. This is explained in terms of the effect of decreasing oxygen solubility at the higher temperature on the local cathodic reaction $2H^+ + 0_2 + 4e = 2OH^-$. Iron corrodes under cathodic control at room temperature, whereas at the higher temperatures there is a mixed cathodic-anodic control.

Corrosion Prevention in Transmission Pipe Networks of Ruhrgas AG. W. von Baeckmann. *Gas- u. Wasserfach 99,* 153 (1958) Feb. 14 (10 pp. German text.)

Brief literature review of recent theory and practice in corrosion protection, with a detailed report on past work on the Ruhrgas AG pipeline system. Topics discussed include current drainage and protection requirements for cathodic protection, mag-

nesium anode characteristics for given pipe-to-earth potential, measured current and resistance in detail for 62 km new pipeline, groundbed installations and influence of foreign current.

Design to Cut Cathodic Protection Costs. O. W. Everett. *Pipe Line Industry 8,* 40 (1958) Mar. (4 pp.)

Attention to some basic fundamentals of corrosion engineering will save money during installation of cathodic protection system. These include surveying the right of way first, making a resistivity survey, grounding bed materials, checking cable corrosion, determining rod requirements and making spacing calculations.

Products Pipe Line Failure under Cathodic Protection. W. H. Bruckner. *Pipe Line News 30,* 45 (1958) Mar. (3 pp.)

It may be desirable to operate an underground system with the objective of 100% corrosion control in the field; however, it is economically undesirable to achieve this control with overprotection. Case history of the failure of a 6½-in. pipeline with recommendations for most economical remedy.

Ceramics

Ceramics from Glass Go Commercial. J. H. Munier. *Product Eng. 29,* 87 (1958) Mar. 17 (3 pp.)

Experimental applications such as ball bearings and pistons have shown promise so Corning Glass has announced commercial productions of two grades of opaque ceramics which should carry this new material into unusual fields. Article gives application data on types available.

Coatings

Asphalt Mastic Coating for Offshore Lines. L. N. Brown. *Gas 34,* 132 (1958) Mar. (7 pp.)

Several years of experimentation led to development of a combination of base asphalt refined from salt free crude, a coarse aggregate of sand and/or heavy weight material, a mineral filler, a binder of emulsified asphalt mixed with hard asphalt and synthetic rubber, an internal reinforcement of chopped fiber glass strands and an external reinforcement of fiber glass mesh. This resulted in a coating that had flexibility and ductility and that could be applied to pipe on location immediately prior to laying.

Flame Spraying of Metals. D. E. J. Cunningham. *Corrosion Tech. 5,* 71 (1958) Mar. (4 pp.)

Review of typical powder and wire guns used in the metal-spraying process.

Guide to Selection of Coal Tar Coatings for Protection of Metals Underground. N. T. Shideler. Part 1. *Petrol Eng. 30,* D-31 (1958) Mar. (5 pp.); Part 2. *Ibid.,* D-29 (1958) Apr. (3 pp.)

Selection of proper coatings, adequate cleaning and proper application of the coating, possibly supplemented by cathodic protection, are a necessity in order to avoid expensive replacement cost or expensive cost for additional supplemental application of cathodic protection to protect metal. Conditions to look for in an underground structure that may have to be uncovered, cleaned and coated are: 1) maximum in-service temperature, 2) soil condition, 3) possibility of high saturation of soil by contaminants, 4) expected atmospheric temperature, 5) types of immersion and 6) possibility of high soil stress.

Long Term Tests with Various Coating Materials. H. W. Wahlquist. *Gas 34,* 69 (1958) Mar. (6 pp.)

In 1946 several pipe specimens with a variety of test coatings were installed in 600 ohm-cm clay soil to determine the behavior of commonly used pipeline coatings and coatings that might be used to coat welded joints on mill-wrapped pipe when continuously subjected to electrical potentials under both anodic and cathodic conditions. Article describes test findings.

Low Cost Hard-facing by Spraying. J. R. Franklin. *Corrosion Tech. 5,* 75 (1958) Mar. (2 pp.)

Improved and greatly simplified techniques for the deposition of hard, wear-resistant coatings by spraying have greatly contributed to the increasing popularity of this type of hard-facing. One of the most important advances in this field is the development of equipment that enables the 'self-fluxing' alloys to be applied at high speed and efficiency.

Plastic Coated Steel Pipe Being Tested by Utilities. *Gas 34,* 75 (1958) Mar. (2 pp.)

Steel pipe over which is extruded a polyethylene coating presents a new approach to problem of external corrosion. Several gas utilities are now testing it.

Protecting Metals at High Temperatures. A. H. Hofstatter. *Materials in Design Eng. 47,* 115 (1958) Apr. (5 pp.)

Comparison of the value of special paints, metallic coatings and ceramic coatings as protective agents. Table indicating approximate maximum useful temperature of coated metals is included.

Protective Coatings Standardization in a Multi-Plant Chemical Operation. *Corrosion 14,* 93 (1958) Apr. (3 pp.)

Problem of standardizing coatings in a multiple plant chemical operation is reviewed. Method adopted by one organization is described and reasons for the decisions given. Examples are offered of specific

standards in use and the company's testing program for new coatings is explained.

Recent Findings in Rust Protective Coatings for the Gas Plants and Cokeries. P. Hoffmann. *Gas- u. Wasserfach 99,* 301 (1958) Mar. 28 (4 pp. German text.)

Review of current standings of protective coatings used in the gas industry. Article describes three requirements for a good rust protective coating, and lists recommendations for application techniques.

Visual Evidence of Coating Theories. J. C. Watts. *Pipe Line Industry 8,* 36 (1958) Mar. (4 pp.)

Laboratory experiments indicate internal coatings can increase efficiencies in gas transmission lines from 5-10%. Photomacrographs of coated samples demonstrate smoothness of coating surface. Article also describes effectiveness of in-place cleaning.

What Makes a Good Asphalt Coating? L. F. Bramble. *Pipe Line Industry 8,* 53 (1958) Mar. (3 pp.)

Complex chemical analyses and physical properties of asphalts often hinder accurate evaluation of pipeline primers and enamels. Tests evaluated in the light of experience help to bridge the gap between laboratory research and good field performance.

Corrosion Measurement

A New Dynamic Test Facility for Aqueous Corrosion Studies. S. Greenberg, J. E. Draley and W. E. Ruther. *Corrosion 14,* 191t (1958) Apr. (2 pp.)

Description of a new high pressure, high temperature dynamic aqueous corrosion test loop. Maximum design operating conditions are 360°C, 3000 psia and 20-30-ft/sec velocity past test specimens. Design allows for greater flexibility of operation and more precise control of corrodent composition than had been obtained previously.

An Electrical Resistance Method of Corrosion Monitoring in Refinery Equipment. A. J. Freedman, E. S. Troscinski and A. Dravnieks. *Corrosion 14,* 175t (1958) Apr. (4 pp.)

Use of a corrosion probe has enabled quantitative determination of corrosion rates in operating refinery equipment in a few hours' time as compared with months required for other methods. Refinery corrosion inhibitors have been compared rapidly in actual use. Effects of changes in unit operating procedures upon corrosion rates have been observed shortly after the changes were made. Sensitive locations where corrosion is expected have been monitored frequently.

Basic Concepts and Practical Aspects of Field Corrosion Investigation. M. A. Riordan. *Corrosion 14,* 171t (1958) Apr. (4 pp.)

General nature of field measurements and pertinent characteristics of a simple corrosion cell are discussed. Practical aspects of typical field measurement techniques such as IR drop, surface potential, pipe to soil potential and resistivity are considered. Article includes Fundamental Corrosion Circuit Reference Diagram for use in relating electrical field measurements to corrosion characteristics.

Corrosion Measurement by Resistance Method. D. M. McCloud. *Gas 34,* 126 (1958) Mar. (4 pp.)

For practical purposes, resistivity measurements on a metal specimen must be made independent of temperature at which resistance is determined, and method should permit measurement without removal of the specimen from the corroding environment. A method which meets these specifications is the Corrosometer method.

Industrial Heating

Reports of the Industrial Gas Development Committee. *Coke Gas 20,* 119 (1958) Mar. (5 pp.)

Particular application of gas heat in aluminum fluoride drying, pipe-bending forge; low temperature plastics molding oven, and an automatic air-gas proportioning governor are described.

Inhibitors

Statistical Concepts in the Testing of Corrosion Inhibitors. C. C. Nathan and E. Eisner. *Corrosion 14,* 193t (1958) Apr. (7 pp.)

Report of tests on both synthetic and actual fluids from producing oil wells. It describes fluctuations in weight losses of test coupons and occurrence of accelerated weight losses and increased differential attack or pitting in systems where low concentrations of organic adsorption type inhibitors are employed. Data from both static and dynamic test systems are analyzed. In particular, the large amount of data collected by laboratories cooperating with the NACE proposed T-1K sour crude inhibitor test have been evaluated. The data are shown to approximate a normal distribution analysis. Other systems are discussed in which normal distribution have been observed.

Insulation

Insulation on Display. *Fuel Efficiency 6,* 36 (1958) Mar. (5 pp.)

Fifty-one leading firms and associations were represented in the thermal insulation section of the sixth Factory Equipment Exhibition, April 14-19. Materials ranging from wood wools slabs and asbestos cement sandwich constructions to hollow glass blocks and expanded plastics were shown.

Reflective Surfaces for Thermal Insulation—An Experiment. *Refrigerating Eng. 66,* 40 (1958) Apr. (3 pp.)

Report of an investigation of the use of reflective surfaces on typical fibrous insulating materials of blanket, batt or board form. When installed with adjoining air spaces, the insulating effect of these materials is increased substantially, especially where the heat flow is downward.

Thermal Insulation Materials. R. J. Fabian. *Materials in Design Eng. 47,* 119 (1958) Mar. 20 pp.)

Thermal insulations encompass a wide range of materials, most of which are characterized by their high content of dead air spaces. No insulation can be used in all hot and cold applications. Article discusses 22 of principal insulations available, their properties and applications for which each is best suited.

Metals

Controlling Corrosion in Coal-Chemical Plants. C. P. Larrabee and W. L. Mathay. *Corrosion 14,* 183t (1958) Apr. (4 pp.)

Data are presented showing the types of constructional materials that are resistant to corrosive elements in coal-chemical plants. Coal handling equipment and processing equipment are discussed with regard to the mitigation of corrosion through proper selection of materials and changes in process conditions. Stainless steels such as AISI Types 304 and 316 were found to be economically resistant to corrosive attack in primary coolers, ammonia saturators, tar stills and light-oil recovery equipment, but should be used only in locations where plant corrosion tests have shown use of these steels to be justified.

Exotic Metals Seek Employment. *Product Eng. 29,* 66 (1958) Mar. 17 (5 pp.)

Nine rare metals, gallium, indium, bismuth, beryllium, chromium, vanadium, hafnium, columbium, and rhenium, are useful for special structural and electrical applications. Many have valuable properties. Chemical and physical properties, availability and recent prices are charted.

Plastic Pipe

Louisville Gas Uses It (Plastic Tubing) to Insulate Services. R. H. Walton, *Gas 34,* (1958) Mar. (2 pp.)

Since 1954, new service in Louisville has consisted of wrapped steel pipe from the main to within 2-3 ft of the customer's property line. This 2-3 ft is connected with plastic pipe. Up to the present time, approximately 10,000 services have been satisfactorily installed in this manner.

1958—Another Good Year for Plastic Pipe. D. Wright. *Gas 34,* 55 (1958) Mar. (4 pp.)

Predictions are that plastic pipe will continue its steady growth throughout the gas industry this year. Main applications, based on last year's usage, will be for inserts in or replacement of existing service lines, new services, new mains and replacement of or insertion in existing mains.

Tubing Used for Drip Pipe in Submerged River Crossing. T. J. Lambeck. *Gas 34,* 64 (1958) Mar. (3 pp.)

Description of installation of 1.5-in. plastic drip pipe inside a 12-in. main across the Fox River in Oshkosh, Wis.

Use of Plastic Tubing to Replace Services in Low Pressure System. H. R. Murphy and T. R. Bogumill. *Gas 34,* 59 (1958) Mar. (5 pp.)

Peoples Gas Light & Coke Co., Chicago, tells of the developments which led to the usage of plastic tubing for insertion renewals of faulty 1½-in. steel, low-pressure services. Article traces histories of steel and copper, with advantages and disadvantages, and of the experience with plastic tubing.

Plastics

Best Plastic for Tanks. W. Reybold. *Chem. Eng. 65,* 152 (1958) Mar. 24 (3 pp.)

Selection of best plastic from wide variety now available for chemical tank construction should be based on specific chemical service at a particular temperature and pressure. Advantages and disadvantages of each type of plastic are considered.

Welding

How to Cut Welding Costs. R. A. Clemens. *Gas Age 121,* 40 (1958) Mar. 6 (5 pp.)

Automatic welding offers advantages of higher current densities, higher melt-off rates and mechanical operation; higher welding speeds reduce labor and overhead costs. One jointing yard reduced field welding by 50% while increasing welding production by 700%.

12. ANALYTICAL METHODS AND TESTS

Calorimetry

Gas Calorimetry. Part 1. The Importance of Heating Value Measurement. *Am. Gas J. 184,* 33 (1957) Nov. (4 pp.); **Part 2. Total Heating Value Calorimeters.** *Ibid.,* 31 (1957) Dec. (4 pp.); **Part 3. Net Heating and Inferential-Type Calori-**

meters. *Am. Gas J. 185,* 23 (1958) Feb. (4 pp.); **Part 4. Comparisons, Calculations and Corrections.** *Ibid.,* 27 (1958) Apr. (7 pp.)

Review of the gas laws governing the quantity of gas in a cubic foot is made to enable calculation of factors applicable to the total heating value per cubic foot at 30 in. of mercury at 60°F, saturated to obtain results at any other base. Comparison of two most generally used gas calorimeters, the manually-operated flow type and the Cutler-Hammer recording type, is presented. The fundamental measurements, calculations and essential problems encountered in making the heating value determination with each instrument are enumerated.

Chromatography

Gas-Liquid Chromatography: Effect of Support Size and Proportion of Liquid Phase on Column Efficiency. J. D. Cheshire and R. P. W. Scott. *J. Inst. Petrol 44,* 74 (1958) Mar (6 pp.)

Effect on efficiency of support size, proportion of liquid phase to support and length of column is described. Conditions required for obtaining column efficiencies of 12,000 theoretical plates are given. Effect of size of charge on high efficiency columns also is discussed.

Thermistor Detectors in Gas Chromatography. A. D. Davis and G. A. Howard. *J. Appl. Chem. 8,* 183 (1958) Mar. (4 pp.)

Details of a simple and easily constructed instrument, employing a thermistor detector, for work on gas chromatography. Some necessary precautions and conditions for use of a thermistor detector are outlined, changes in signal strength and direction with variation of detector position are discussed, and the over-all sensitivity and response to differing materials are described.

Coal Analysis

Procedure for Coal Sample Preparation. D. Flint and W. D. Ray. *J. Inst. Fuel 31,* 123 (1958) Mar. (10 pp.)

Statistically designed series of experiments, based on duplicate ash determination of subsamples, were conducted on two coals of high ash content and variances of analysis and reduction estimated. Results indicate that lower reduction errors are obtained than in previous investigations and confirm that nothing is gained by increasing the weight of subsample at the first stage of reduction.

Coal Minerals

The Mineral Matter in Coal I—The Water of Constitution of the Silicate Constituents. J. O'N. Millott. *Fuel 37,* 71 (1958) Jan. (15 pp.)

Coal Survey Organization of the National Coal Board (Great Britain) is making a reassessment of the King, Maries and Crossley formula for the calculation of mineral matter in coal from the determined ash and other analytical data. Largest arithmetical factor is that relating to the correction of the determined ash for the water of constitution of the hydrated silicates. This article describes the results of a comprehensive investigation of this factor in relation to hand-cleaned, seam samples.

Coal Sulfur

An Investigation into Methods for the Determination of Forms of Sulphur in Coal. A. H. Edwards, G. N. Daybell and W. J. S. Pringle. *Fuel 37,* 47 (1958) Jan. (15 pp.)

Methods of the British Standards Institution, the Fuel Research Board and the British Coke Research Association for the determination of forms of sulfur in coal have been investigated. Latter method is shown to give most accurate results.

Dust Determination

Investigation of Sampling Procedure Requirements. A. D. Little, Inc. New York: American Gas Association, 1957.

Particle-laden gas, when removed from a gas stream without regard for possible sampling errors, will very probably be nonrepresentative. Errors may occur because of the use of incorrect sampling velocity, bends in the sampling line, settling of particles, heating or cooling of the sample and improper orientation of the sampling nozzle. Objective of report is to devise methods for estimating the error that may be expected because of these effects. Requirements for best sampling have been established.

Mass Spectrometer

Mass Spectrometry in Process Control. R. Wall. *Control Eng. 5,* 113 (1958) Apr. (6 pp.)

The mass spectrometer, which can rapidly analyze multicomponent streams ranging from gases to fairly heavy liquids that have been converted to a vapor, has been used in monitoring isotope separation units in atomic energy plants; locating producing zones in oil fields by analyzing drilling muds, analyzing exhaust gases and fuel-air mixtures for rapid and effective studies of the operation of internal combustion, jet and gas turbine engines; controlling underground combustion processes; controlling furnace atmosphere in high-vacuum metallurgy, and controlling a process to extract byproduct sulfur from natural and refinery gases.

Ultimate Analysis

Occurrence of Oxides of Nitrogen and Sulphur in the Determination of Carbon and Hydrogen in Coal. R. A. Mott and H. C. Wilkinson. *Fuel 37,* 62 (1958) Jan. (9 pp.)

An investigation has shown that oxides of nitrogen in the gases leaving a Liebig or Sheffield High Temperature combustion tube are negligible in amount and that the acidic gases absorbed in a manganese dioxide absorber after the tube are chiefly oxides of sulfur. A manganese dioxide absorber provides a factor of safety in that it absorbs acidic gases which may pass the normal packings designed to retain them. The Liebig and Sheffield High Temperature Methods, with manganese dioxide absorbers in the train, give the same mean values of carbon and hydrogen.

13. BASIC SCIENCE

Absorption

Absorption and Humidification. M. Leva and C.-Y. Wen. *Ind. Chem. Eng. 50,* 421 (1958) Mar. (3 pp.)

Contributions in the fields of mechanical operation of towers, apparatus construction, and development of new packings have diminished in recent years. Noteworthy is the sudden interest in wetted wall-type and grid-type towers. Chief emphasis in fundamental studies has been on a better understanding of droplet, film and foam behavior.

Adsorption

Adsorption. B. L. Harris. *Ind. Chem. Eng. 50,* 424 (1958) Mar. (4 pp.)

Review of industrial and unit operations aspects of adsorptions, including industrial separations, gas chromatography, liquid phase studies and preparation of adsorbents.

Air Emissivity

Emissivity of High Temperature Air. J. Keck, B. Kivel and T. Wentink, Jr. *Appl. Mech. Rev. 11,* 139 (1958) Mar. (From Heat Trans. and Fluid Mech. Inst. Calif. Inst. Tech., June 1957 (16 pp.))

Spectral measurements, made in a shock tube, of radiation from air at temperatures between 5000°K and 9000°K are presented, together with a theoretical explanation of the results obtained. Discrepancies and regimes where present knowledge is inadequate are discussed.

A. Whillier

Binary Phase Boundaries

The Law of Corresponding States for Binary Gas + Liquid Mixtures. M. B. King. *Trans. Faraday Soc. 54,* 149 (1958) Feb. (12 pp.)

Derivation of a form of principle of corresponding states, applicable to binary solutions, using statistical mechanical and dimensional arguments. Equations are developed relating the critical constants of mixtures to those of pure components. Phase-boundary data for 24 binary systems are analyzed.

Carbon Monoxide

Hemoglobin Studies. I. The Combination of Carbon Monoxide with Hemoglobin and Related Model Compounds. J. H. Wang, A. Nakahara and E. B. Fleischer. *J. Am. Chem. Soc. 80,* 1109 (1958) Mar. 5 (5 pp.)

Nature of bind of carbon monoxide to hemoglobin, heme and Fe(II)-dicysteinate was studied by means of infrared and magnetic measurements. Formation constant of carbonmonoxyheme was determined and compared to that of carboxyhemoglobin. Possible cause for the unusual resistance of hemoglobin derivatives toward oxidation by molecular oxygen was proposed.

Catalysis

Heterogeneous Catalysis. M. J. Boudart and G. Parravano. *Ind. Chem. Eng. 50,* 486 (1958) Mar. (3 pp.)

Significant results in kinetic studies of catalysis demonstrate theoretical and practical rewards of a sustained kinetic program in catalysis.

The Mechanism of Chemisorption: Hydrogen on Nickel at Elevated Pressures. *J. Am. Chem. Soc. 80,* 1331 (1958) Mar. 20 (1958)

Volumetric method is presented for gas adsorption on solids at adsorbate pressures above 1 atm. Method is used for simultaneous measurement of hydrogen adsorption and of specific magnetization up to 140 atm on a supported nickel catalyst. Some results are given in terms of magnetization-pressure and magnetization-volume isotherms, all at room temperature.

Catalyst

Catalyst for Reforming Lower Hydrocarbons; Formulation Suitable for Extrusion of Same. K. D. Ashley and W. B. Innes (assigned to American Cyanamid Co.) U.S. 2,825,700 (1958) Mar. 4.

Gas reforming nickel catalyst of improved crush strength is claimed, comprising basic nickel carbonate filter cake, 35-13 parts, hydraulic cement, 65-87 parts, hydrated and aged, then extruded and dried.

Equation of State

Generalized Equation of State for Gases and Liquids. J. O. Hirschfelder, R. J. Buehler, H. A. McGee, Jr. and J. R. Sutton. *Ind. Eng. Chem. 50,* 375 (1958) Mar. (12 pp.)

An equation of state for pure substances covers the full range of gases and liquids. Its standard form is based on a generalized principle of corresponding states which includes two additional experimental parameters; the critical compressibility factor, Z_c, and a parameter, determined from vapor pressure. The equation for liquids also includes experimental densities at saturation.

Equilibria

Predicting Convergence Pressure. J. M. Lenoir and G. A. White. *Petrol. Refiner 37,* 173 (1958) Mar. (9 pp.)

Method for predicting equilibrium constants for multicomponent mixtures for a wide range of temperature and pressure is good for various mixtures, including paraffins, olefins, naphthenes, aromatics and nonhydrocarbons which normally occur in hydrocarbon mixtures.

Experiment Design

Plan Before You Start Experimenting. H. F. Smith. *Petrol. Refiner 37,* 201 (1958) Mar. (8 pp.)

Basic philosophy behind new approach to industrial experimentation is determination of optimum conditions. "Box Method of Experimentation" determines surface contours of a dependent response to the independent experimental conditions imposed on a process. Its outstanding attribute is that a maximum of information can be extracted from a minimum of experimentation.

Fluid Flow

Entrapment of Gas in the Spreading of a Liquid Over a Rough Surface. S. G. Bankoff. *A.I.Ch.E. J. 4,* 24 (1958) Mar. (3 pp.)

Conditions for incomplete displacement of gas from the valley between two parallel ridges by a liquid-drop front advancing over the ridges are calculated. Significant parameters are found to be liquid density, surface tension, contact angle and geometry of the ridges. Solution may be derived analytically or graphically.

Flow of Fluids. M. Weintraub. *Ind. Chem. Eng. 50,* 447 (1958) Mar. (6 pp.)

Extension of fluidization operation to new processes marks a widening activity in multiphase fluid relationships. Review of work accomplished in recent years is included.

Longitudinal Mixing of Fluids Flowing in Circular Pipes. O. Levenspiel. *Ind. Eng. Chem. 50,* 343 (1958) Mar. (4 pp.); **How Much Mixing Occurs in a Pipe?** *Petrol. Refiner 37,* 191 (1958) Mar. (4 pp.)

Article presents relationships for both streamline and turbulent flow, predicting magnitude of such mixing. Resulting design charts incorporated all available data in the literature. Development of design charts is suggested by dimensional analysis and a model which assumes that fluid mixing in the axial direction is analogous to molecular diffusion. This results in the charaacterization of the mixing process by a single parameter, the longitudinal dispersion coefficient, similar to the molecular diffusion coefficient.

Pressure Drop Nomographs. J. E. Gardner. *Chem. Processing 21,* 79 (1958) Apr. (2 pp.)

Nomographs for use in calculating frictional pressure losses for turbulent fluids flowing through commercial steel pipe. Two steps required: calculation of velocity head, then calculation of number of velocity heads lost in pipe system.

Rates of Flow Through Microporous Solids. E. R. Gilliland, R. F. Baddour and J. L. Russell. *A.I.Ch.E. J. 4,* 90 (1958) Mar. 7 pp.)

Rates of flow of pure gases, both those with no adsorption and those with appreciable adsorption, were studied as a function of pressure level, pressure drop and temperature for flow through ½-in. diameter cylindrical plugs of activated carbon and of unsintered Vycor glass. Adsorption isotherms for the pure gases on Vycor glass were measured over the range of variables covered in the flow studies. A few measurements were obtained for bulk liquid flowing through a Vycor plug.

Gasification Kinetics

A Kinetic Theory for the Oxidation of Carbonized Filaments. G. Blyholder, J. S. Binford, Jr. and H. Eyring. *J. Phys. Chem. 62,* 263 (1958) Mar. (5 pp.)

Considerable data on the CO_2 reaction have been collected from the literature, evaluated and expressed in such a manner that comparisons can be made. A theory is proposed which is applicable to the temperatture range from 750°-2000°. In particular, the unusual maximum in the Arrhenius plot is explained on a theoretical basis.

Heat Capacities

Heat Capacity Ratios—5 Hydrocarbons. J. Joffe and E. G. Delaney. *Chem. Eng. 65,* 138 (1958) Mar. 24 (4 pp.)

Accurate values of heat capacity ratios of ethane, ethylene, n-butane, methane and propane may be determined by application of recently developed graphs. Wide range of temperature and pressure given for C_p/C_v ratio increases its usefulness in many applications.

Hydrocarbons

Compression and Densities of Four Solidified Hydrocarbons and Carbon Tetrafluoride at 77°K. J. W. Stewart and R. I. LaRock. *J. Chem. Phys. 28,* 425 (1958) Mar. (3 pp.)

Bridgman's piston displacement method has been used to measure volume changes and compressibilities of solid ethane, ethylene, propane, propylene and carbon tetrafluoride from 0-20,000 kg/cm² at 77°K. The only polymorphic phase change observed is a first order transition at $P = 180 \pm 80$ kg/cm² at 77° in CF_4. Densities of these solidified gases at 77° have been measured at atmospheric pressure by direct condensation into a volumetric flask. The accompanying pressure drop in a storage tank of known volume is observed.

Ion Exchange

Ion Exchange. R. Kunin, F. X. McGarvey and D. Zobian, *Ind. and Chem. Eng. 50,* 458 (1958) Mar. (5 pp.)

Ion exchange as a unit operation has become a standard method of operation throughout the entire field of chemical engineering. Most interesting and controversial studies made on pure metals stem from attempts to interpret radiation damage studies. Also has been used in uranium and rare metal recovery, food purification and desalinization of water.

Phase Equilibria

Phase Equilibria in Binary and Multicomponent Systems. Modified van Laar-Type Equation. C. Black. *Ind. Eng. Chem. 50,* 403 (1958) Mar. (10 pp.)

General equations have been derived relating activity coefficient and liquid composition in multicomponent systems They are of the van Laar type empirically modified to account for influences due to association and interassociation in the solution. Coefficients are those for individual binary systems; each binary is represented with a maximum of three coefficients.

Vapor Phase Imperfections in Vapor-Liquid Equilibria. Semiempirical Equation. C. Black. *Ind. Eng. Chem. 50.* 391 (1958) Mar. (12 pp.)

Main area of interest in vapor-liquid equilibria is below the critical temperature where a completely generalized representation, in reduced temperature and pressure only, is not valid. For this area, a semiempirical equation of state has been developed. It is explicit in volume and can be applied to nonpolar substances with the aid of three properties: critical temperature, critical pressure and vapor pressure. For polar substances one or two individual coefficients in addition to these are necessary. The equation is applicable not only to pure substances but to binary and multicomponent mixtures as well.

Radioisotopes

The Safe Use of Isotopes in Industry. W. A. Brobst. *Mech. Eng. 80,* 69 (1958) Mar. (2 pp.)

Use of isotopes as oil pipeline markers, gages, in industrial radiography, for wear studies, as radiation sources and in agriculture is already saving over $500 million annually in return for a direct outlay of about $3 million annually. By 1960, these savings should increase to $5 billion. Isotopes probably will be paying the way soon for the entire atomic industry, including weapons and power programs, as represented by these savings.

Thermodynamics

Molecular Structure and Properties of Hydrocarbons and Related Compounds. J. B. Greenshields and F. D. Rossini. *J. Chem. Phys. 62,* 271 (1958) Mar. (10 pp.)

Empirical equations, involving only structural parameters, are presented for calculating the isomeric variation in the values of certain physical and thermodynamic properties of the paraffin hydrocarbons. Those properties are the molal volume, the molal refraction, the standard heat of formation, the standard heat of vaporization (all at 25°), the normal boiling point and the boiling point at 10 mm.

Thermodynamics of Fluids

Volumetric and Thermodynamic Properties of Fluids —Enthalpy, Free Energy, and Entropy. R. F. Curl, Jr. and K. S. Pitzer. *Ind. Eng. Chem. 50,* 265 (1958) Feb. (10 pp.)

Volumetric properties of normal fluids have been treated extending the theory of corresponding states involving the acentric factor to yield an accuracy about one order of magnitude higher than the simple theory of corresponding states. Extension includes thermodynamic properties, enthalpy, free energy and entropy by calculations based upon volumetric functions. Criterion of a normal fluid is studied and a formula based on surface tension selected. Method for calculating critical constants from vapor pressure data in the vicinity of the normal boiling point and liquid density is presented.

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